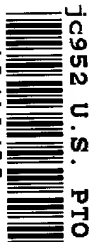


10/12/00



10/12/00 U.S. PTO

10-16-00

EL 465851467

A

PTO/SB/05 (4/98)

Approved for use through 09/30/2000. OMB 0651-0032

Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))	Attorney Docket No.	AM19-013
	First Inventor or Application Identifier	Jerry L. Johnson
	Title	Display Element Having Retroreflective Surface
	Express Mail Label No.	EL465851467US

APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents	ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20231	
1. <input checked="" type="checkbox"/> * Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)	5. <input type="checkbox"/> Microfiche Computer Program (Appendix)	
2. <input checked="" type="checkbox"/> Specification [Total Pages 32] (preferred arrangement set forth below) <ul style="list-style-type: none">- Descriptive title of the Invention- Cross References to Related Applications- Statement Regarding Fed sponsored R & D- Reference to Microfiche Appendix- Background of the Invention- Brief Summary of the Invention- Brief Description of the Drawings (if filed)- Detailed Description- Claim(s)- Abstract of the Disclosure	6. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary) <ul style="list-style-type: none">a. <input type="checkbox"/> Computer Readable Copyb. <input type="checkbox"/> Paper Copy (identical to computer copy)c. <input type="checkbox"/> Statement verifying identity of above copies	
3. <input checked="" type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets 14]	ACCOMPANYING APPLICATION PARTS <ul style="list-style-type: none">7. <input checked="" type="checkbox"/> Assignment Papers (cover sheet & document(s))8. <input type="checkbox"/> 37 C.F.R. § 3.73(b) Statement (when there is an assignee) <input type="checkbox"/> Power of Attorney9. <input type="checkbox"/> English Translation Document (if applicable)10. <input checked="" type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations11. <input checked="" type="checkbox"/> Preliminary Amendment12. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) (Should be specifically itemized)13. <input type="checkbox"/> * Small Entity Statement(s) <input checked="" type="checkbox"/> Statement filed in prior application (PTO/SB/09-12) Status still proper and desired14. <input type="checkbox"/> Certified Copy of Priority Document(s) (if foreign priority is claimed)15. <input checked="" type="checkbox"/> Other: Check Request for Substitute Drawings Substitute Drawings	
4. Oath or Declaration [Total Pages 5] <ul style="list-style-type: none">a. <input type="checkbox"/> Newly executed (original or copy)b. <input checked="" type="checkbox"/> Copy from a prior application (37 C.F.R. § 1.63(d)) (for continuation/divisional with Box 16 completed)<ul style="list-style-type: none">i. <input type="checkbox"/> DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).		
* NOTE FOR ITEMS 1 & 13 IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).		
16. If a CONTINUING APPLICATION , check appropriate box, and supply the requisite information below and in a preliminary amendment: <input checked="" type="checkbox"/> Continuation <input type="checkbox"/> Divisional <input type="checkbox"/> Continuation-in-part (CIP) of prior application No. 09/087,765 Prior application information: Examiner C. Nguyen Group / Art Unit: 2775		

For **CONTINUATION** or **DIVISIONAL APPS** only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS			
<input checked="" type="checkbox"/> Customer Number or Bar Code Label: 021567 (Insert Customer No. or Attach bar code label here)		or <input type="checkbox"/> Correspondence address below	
Name			
Address			
City	State	Zip Code	
Country	Telephone	Fax	

Name (Print/Type)	George A. Grigel	Registration No. (Attorney/Agent)	31,166
Signature		Date	12 OCT 2000

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

EL 465851467

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Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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**FEE TRANSMITTAL
for FY 2000**Patent fees are subject to annual revision.
Small Entity payments must be supported by a small entity statement,
otherwise large entity fees must be paid. See Forms PTO/SB/09-12.
See 37 C.F.R. §§ 1.27 and 1.28.**TOTAL AMOUNT OF PAYMENT** (\$) 435.00**Complete if Known**

Application Number	
Filing Date	
First Named Inventor	Jerry L. Johnson et al.
Examiner Name	
Group / Art Unit	
Attorney Docket No.	AM19-013

METHOD OF PAYMENT (check one)

- 1.
- ☒
- The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number 22-0925Deposit Account Name Wells, St. John☐ Charge Any Additional Fee Required
Under 37 CFR §§ 1.16 and 1.17

- 2.
- ☒
- Payment Enclosed:**

☒ Check ☐ Money Order ☐ Other**FEE CALCULATION****1. BASIC FILING FEE**

Large Entity Code (\$)	Small Entity Code (\$)	Fee Description	Fee Paid
101 690	201 345	Utility filing fee	355.00
106 310	206 155	Design filing fee	
107 480	207 240	Plant filing fee	
108 690	208 345	Reissue filing fee	
114 150	214 75	Provisional filing fee	

SUBTOTAL (1) (\$) 355.00**2. EXTRA CLAIM FEES**

Total Claims	Extra Claims	Fee from below	Fee Paid
4	-20** = 0	X 9	= 0
4	-3** =	X 40	=
Multiple Dependent			= 0

**or number previously paid, if greater; For Reissues, see below

Large Entity Code (\$)	Small Entity Code (\$)	Fee Description	Fee Paid
103 18	203 9	Claims in excess of 20	
102 78	202 39	Independent claims in excess of 3	
104 260	204 130	Multiple dependent claim, if not paid	
109 78	209 39	** Reissue independent claims over original patent	
110 18	210 9	** Reissue claims in excess of 20 and over original patent	

SUBTOTAL (2) (\$) 40.00**FEE CALCULATION (continued)****3. ADDITIONAL FEES**

Large Entity Code (\$)	Small Entity Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	0.00
127 50	227 25	Surcharge - late provisional filing fee or cover sheet	0.00
139 130	139 130	Non-English specification	0.00
147 2,520	147 2,520	For filing a request for reexamination	0.00
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	0.00
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	0.00
115 110	215 55	Extension for reply within first month	0.00
116 380	216 190	Extension for reply within second month	0.00
117 870	217 435	Extension for reply within third month	0.00
118 1,360	218 680	Extension for reply within fourth month	0.00
128 1,850	228 925	Extension for reply within fifth month	0.00
119 300	219 150	Notice of Appeal	0.00
120 300	220 150	Filing a brief in support of an appeal	0.00
121 260	221 130	Request for oral hearing	0.00
138 1,510	138 1,510	Petition to institute a public use proceeding	0.00
140 110	240 55	Petition to revive - unavoidable	0.00
141 1,210	241 605	Petition to revive - unintentional	0.00
142 1,210	242 605	Utility issue fee (or reissue)	0.00
143 430	243 215	Design issue fee	0.00
144 580	244 290	Plant issue fee	0.00
122 130	122 130	Petitions to the Commissioner	0.00
123 50	123 50	Petitions related to provisional applications	0.00
126 240	126 240	Submission of Information Disclosure Stmt	0.00
581 40	581 40	Recording each patent assignment per property (times number of properties)	40.00
146 690	246 345	Filing a submission after final rejection (37 CFR § 1.129(a))	0.00
149 690	249 345	For each additional invention to be examined (37 CFR § 1.129(b))	0.00
Other fee (specify) _____			0.00
Other fee (specify) _____			0.00

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$) 40.00**SUBMITTED BY**Name (Print/Type) George G. GrigelSignature Registration No.
(Attorney/Agent)31,166**Complete (if applicable)**

Telephone

509-624-4276

Date

OCT 12, 2000**WARNING:**

Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor Johnson et al
 Attorney's Docket No. AM19-005
 Title: PIXEL FOR USE IN A VISUAL MATRIX DISPLAY

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
 (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled IMPROVED DISPLAY ELEMENT described in specification filed herewith.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☐ no such person, concern, or organization
☒ persons, concerns or organizations listed below

NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME: American Electronic Sign Company

ADDRESS: Spokane Industrial Park, Bldg. 10, N. 3808 Sullivan Road, Spokane WA 99216-1670

☐ Individual ☒ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Jerry L. Johnson
 Name of Inventor
Jerry L. Johnson
 Signature of Inventor
DEC. 1ST, 1995
 Date

Kevin M. Hanson
 Name of Inventor
Kevin M. Hanson
 Signature of Inventor
12-1-95
 Date

Kenneth R. Cummings
 Name of Inventor
Kenneth R. Cummings
 Signature of Inventor
12-1-95
 Date

Edward A. Wilson
 Name of Inventor
Edward A. Wilson
 Signature of Inventor
12-1-95
 Date

EL 465851467

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors Johnson et al.
 Attorney's Docket No. AM19-005
 Title: PIXEL FOR USE IN A VISUAL MATRIX DISPLAY

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
 (37 CFR 1.9(f) and 1.27(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

- ☐ the owner of the small business concern identified below:
☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN: American Electronic Sign Company
 ADDRESS OF CONCERN: Spokane Industrial Park, Bldg. 10, N. 3808 Sullivan Road, Spokane, WA 99216-1670

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled "Improved Display Element" by inventor(s) Jerry L. Johnson, Kevin M. Hanson, Kenneth R. Cummings and Edward A. Wilson, described in the specification filed herewith.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e). *Note: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME:
 ADDRESS:
☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization
 ADDRESS:
☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name of Person Signing: Nathan S. Batson
 Title of Person Other Than Owner _____
 Address of Person Signing: N. 3808 Spokane Industrial Park, Bldg 10, N. 3808 Sullivan Road, Spokane, WA 99216-1670
 Signature: Nathan S. Batson Date: Dec. 1, 1995

EL 465851467

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Priority (Parent) Application Serial No. 09/087,765
 Priority Filing Date May 29, 1998
 Inventor Jerry L. Johnson et al.
 Assignee American Electronic Sign Company
 Priority Group Art Unit 2775
 Priority Examiner C. Nguyen
 Attorney's Docket No. AM19-013
 Title: Display Element Having Retroreflective Surface (As amended herein)

PRELIMINARY AMENDMENT

To: Assistant Commissioner for Patents
Washington, D.C. 20231

From: George G. Grigel (Tel. 509-624-4276; Fax 509-838-3424)
 Wells, St. John, Roberts, Gregory & Matkin P.S.
 601 W. First Avenue, Suite 1300
 Spokane, WA 99201-3828
 (PTO Customer No. 021567)

Sir:

Applicants in the above-identified application, hereby preliminarily
 amend the above-identified application as follows:

AMENDMENTSIn the Title

Kindly delete the title of this application in its entirety and substitute
 therefor --DISPLAY ELEMENT HAVING RETROREFLECTIVE
 SURFACE--.

1 **In the Abstract of the Disclosure**

2 Page 33, lines 10 and 12, kindly delete --means-- and insert --an
3 assembly-- (both occasions).
4

5 **In the Specification**

6 Page 1, line 1 through page 1, line 6, kindly delete the text in its
7 entirety and substitute therefor -- This is a continuing application based on
8 co-pending application Serial Number 09/087,765 filed on May 29, 1998. --

9 Page 2, line 6, after the word "emitted", insert ---;

10 Page 2, line 7, kindly delete --reflective surface---.
11

12 **In the Claims**

13 Kindly delete claims 1-24 without prejudice. Still further, kindly
14 consider new claims 27-30 which are provided herewith.
15

16 27. A pixel for use in a visual matrix display, comprising:
17 a frame defining an aperture;
18 a first retroreflective surface at least partially surrounding the aperture,
19 the retroreflective surface defining a forward plane;
20 an electromagnet mounted on the frame and which when energized
21 produces a magnetic force;
22 a light source having a light discharge located forward of the forward
23 plane defined by the retroreflective surface, and wherein the light source when

energized appears, from a normal viewing distance, to substantially uniformly illuminate the retroreflective surface to appear uniformly backlit and with a substantially brightly illuminated portion adjacent the uniformly illuminated retroreflective surface;

a flap adjacent the aperture, and which further is moveable between a first position wherein the pixel is nonoperational and the flap is disposed in covering relation relative to the light discharge and the first retroreflective surface, and a second operational position;

wherein the flap has a second retroreflective surface which is exposed when the flap is oriented in the second position;

wherein a magnet is mounted on the flap and is influenced by the electromagnet when the electromagnet is energized, causing the flap to move toward one of the positions under the influence of magnetic force generated by the electromagnet; and

means for selectively energizing the light source and the electromagnet.

28. A pixel for use in a visual matrix display, comprising:

a frame having front and rear surfaces, and defining first and second apertures, the front surface defining a forward plane;

a first opaque retroreflective surface surrounding the first aperture;

an electromagnet mounted on the frame and which when energized produces a magnetic force;

1 a first and second light sources, each having a light discharge
2 individually received in the respective first and second apertures, each of the
3 light discharges being located forward of the forward plane and wherein the
4 first light source when energized appears to substantially uniformly illuminate
5 the first retroreflective surface and further provides a substantially brightly
6 illuminated portion adjacent the uniformly illuminated retroreflective surface;

7 a flap mounted on the frame adjacent the first opaque retroreflective
8 surface, and wherein the flap has a third aperture formed therein, and
9 wherein the flap is moveable along a given path of travel between a first
10 position wherein the flap is disposed in substantial covering relation relative
11 to the first retroreflective surface, and the third aperture is substantially
12 coaxially aligned with the first light source, and a second position;

13 wherein the flap has a second retroreflective surface which is exposed
14 when the flap is oriented in the second position and the third aperture is
15 substantially coaxially aligned with the second light source, and wherein the
16 first and second light sources, when energized appear to substantially
17 uniformly illuminate the first and second retroreflective surfaces such that it
18 appears that each is uniformly backlit and further provides a substantially
19 bright illuminated portion adjacent the substantially uniformly illuminated first
20 and second retroreflective surfaces;

21 wherein a magnet is disposed on the flap for reaction with the
22 electromagnet such that when the electromagnet is energized, the magnet will
23

1 react and cause the flap to move along the path of travel under the influence
2 of the magnetic force generated by the electromagnet; and

3 means for selectively energizing the first and second light sources and
4 the electromagnet to provide illumination and locate the flap in one of the
5 positions along the path of travel.
6

7 29. A pixel for use in a visual matrix display, comprising:

8 a frame;

9 a first retroreflective surface on the frame;

10 a light source with a light discharge end projecting through an
11 aperture formed through the first retroreflective surface, and operable to emit
12 light toward the retroreflective surface such that light from the light source
13 will be reflected outwardly from the first retroreflective surface;

14 a flap on the frame and moveable between a first position in
15 covering relation to at least part of the first retroreflective surface, and a
16 second operational position; and

17 means for shifting the flap between the first and second positions.
18

19 30. A pixel for use in a visual matrix display, comprising:

20 a frame;

21 a retroreflective lens on the frame and including a front surface
22 facing forwardly away from the frame and a rearward surface;

23 an aperture formed through the retroreflective lens;

1 a light source mounted to the frame and disposed thereon
2 through the aperture in forwardly spaced relation to the back surface and
3 operable to emit light forwardly and toward the front surface such that light
4 from the light source will be reflected forwardly from the lens;

5 a flap on the frame and moveable between a first position in
6 covering relation to at least part of the lens, and a second operational
7 position; and

8 means for shifting the flap between the first and second positions.

9
10 **REMARKS**

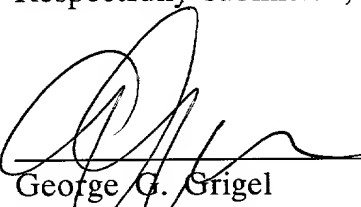
11 Claims 1-24 are canceled without prejudice and new claims 27-30 are
12 added by this preliminary amendment. No new matter is added by this
13 amendment.

14 Entry of this amendment and favorable action on the merits of the
15 presently submitted claims is hereby requested.

16 Respectfully submitted,

17
18 Dated: Oct 12, 2000

Attorney:


George G. Grigel
Reg. No. 31,166

EL 465851467

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR LETTERS PATENT

* * * * *

PIXEL FOR USE IN A VISUAL MATRIX DISPLAY

* * * * *

INVENTORS

**JERRY L. JOHNSON
KEVIN M. HANSON
KENNETH R. CUMMINGS
EDWARD A. WILSON**

ATTORNEY'S DOCKET NO. AM19-005

1 This application is a continuation in part of Application Serial No.
2 08/331,261 and which was filed on October 28, 1994. Application Serial
3 No. 08/331,261 is a continuation of application Serial No.08/188,602 and
4 which was filed on January 27, 1994, now abandoned. Application
5 Serial No. 08/188,602 is a continuation of Application Serial No.
6 07/978,987, and which was filed on November 19, 1992, also abandoned.

7 8 TECHNICAL FIELD

9 The present invention relates to a pixel for use in a visual matrix
10 display and more particularly, to improved pixels employing both
11 translucent and opaque retroreflecting means. The pixels of the present
12 invention find usefulness in all manner of informational display devices.

13 14 BACKGROUND OF THE INVENTION

15 Electronic display devices are commonly used today in many
16 applications including portable highway safety signs, billboards,
17 scoreboards and other informational displays. These display devices
18 consist of multiple rows of individual display elements which constitute
19 controllable pixels in a visual matrix display. Predetermined patterns of
20 display elements can be programmed to create any desired message,
21 design or image.

22 The prior art is replete with numerous disclosures of electronic
23 display devices. For example, one such display element employed with
24 such devices includes an opaque panel having an aperture provided

1 therein, and an associated flap which is pivotable from a first position
2 covering the aperture, to a second position uncovering the aperture.
3 The side of the flap which faces an observer when the aperture is
4 covered has a substantially nonreflective surface. The other side of the
5 flap which faces the observer when the flap is uncovered has a highly
6 reflective surface. Accordingly, when the flap is open, light is emitted
7 through the. Further, ambient light is reflected from the reflective
8 surface of the flap towards the observer.

9 The electronic display element identified above typically has a
10 translucent lens covering an associated aperture. Still further, U.S.
11 Patent No. 5,111,193 to Huber, et al., describes an electronic display
12 element having a translucent lens in a panel aperture and a pivotable
13 flap which covers and exposes the lens. The reference to Huber is
14 incorporated by reference herein.

15 While the devices identified above have operated with varying
16 degrees of success, there are shortcomings in each of the devices which
17 have detracted from their usefulness under certain operational and
18 environmental conditions. For example, under conditions of poor
19 visibility, such as what might be experienced in heavy fog, rain, snow
20 and the like, these same signs may not be as readily visibly discernable
21 as under normal viewing conditions. It would be desirable, therefore,
22 to provide an improved pixel for use in a visual matrix display and
23 which has improved visibility under poor viewing conditions such as
24 described above.

1 Still other shortcoming with the prior art devices have been a
2 result of characteristics inherent in their overall design. For example,
3 the prior art has disclosed the use of individual energizable lamps which
4 are disposed in light emitting relation relative to the respective pixels.
5 The individual lamps are energized and deenergized by a programmable
6 controller. As would be expected, the maintenance of these individual
7 lamps is often time consuming, and difficult in view of the remote
8 locations where these devices are often employed. Still another
9 shortcoming with the devices described in the prior art references
10 relates to the operational modes of the pixels. For example, most of
11 the prior art devices have only two specific modes of operation, that
12 is, the pixel is either in an operational condition (on) or a
13 nonoperational condition (off). It would be highly desirable therefore,
14 to provide a pixel which has more than one mode of operation thereby
15 providing increased design options for a programmer of such devices.

16 The present invention provides several forms of an improved pixel
17 for a visual matrix display which effectively transmits light provided to
18 the pixel from various light sources. The pixel of the present invention
19 further reflects light originating from sources in front of the visual
20 matrix display thereby providing a visual matrix display which remains
21 visibly discernable notwithstanding the deenergized state of an associated
22 light source.

BRIEF DESCRIPTION OF THE DRAWINGS

One or more preferred embodiments of the invention are described below with reference to the following accompanying drawings.

Figure 1 is a perspective, environmental view of a visual matrix display which employs the various forms of the pixel of the present invention.

Figure 2 is an enlarged, exploded, perspective view, of one form of the present invention.

Figure 3 is a fragmentary, side elevation view, of a translucent lens and accompanying fiber optic cable employed with one form of the present invention.

Figure 4 is a fragmentary, front elevation view, of a translucent lens employed with one form of the present invention.

Figure 5 is a second, fragmentary, side elevation view of a translucent lens and accompanying fiber optic cable employed with one form of the present invention.

Figure 6 is a third, fragmentary, side elevation view of a translucent lens employed with one form of the present invention.

Figure 7 is a greatly enlarged, transverse, vertical sectional view taken from a position along line 7-7 of Figure 6.

Figure 8 is a fragmentary, perspective view of one form of lighting and fiber optic cable assembly employed with the present invention.

1 Figure 9 is a fragmentary, perspective view of an alternate form
2 of a lighting and fiber optic cable assembly employed with the present
3 invention.

4 Figure 10 is a greatly enlarged, front elevation view of one form
5 of the pixel of the present invention.

6 Figure 11 is a greatly enlarged, side elevation view of one form
7 of the pixel of the present invention.

8 Figure 12 is a greatly enlarged, side elevation view of one form
9 of the pixel of the present invention.

10 Figure 13 is a greatly enlarged, front elevation view of one form
11 of the pixel of the present invention.

12 Figure 14 is a greatly enlarged, vertical sectional view of one
13 form of the pixel of the present invention.

14 Figure 15 is a greatly enlarged, vertical sectional view of one
15 form of the pixel of the present invention.

16 Figure 16 is a greatly enlarged, front elevation view of one form
17 of the pixel of the present invention.

18 Figure 17 is a greatly enlarged, transverse, vertical sectional view
19 of one form of the pixel of the present invention.

20 Figure 18, A,B, and C, respectively, are greatly enlarged front
21 elevation views of one form of the pixel of the present invention,
22 shown in their individual modes of operation.
23
24

1 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

2 This disclosure of the invention is submitted in furtherance of the
3 constitutional purposes of the U.S. Patent Laws "to promote the
4 progress of science and useful arts" (Article 1, Section 8).

5 U.S. Patent No. 5,111,193 to Huber, et al. is hereby incorporated
6 by reference into this disclosure.

7 Figure 1 shows a visual matrix display which employs the pixels
8 of the present invention. The visual matrix display includes a housing
9 11 which has a front surface, or panel 12. Side walls 13 extend
10 substantially normally rearwardly relative thereto. The housing has a
11 back surface 14 which allows access to the interior cavity (not shown)
12 of the housing 11. The front panel or surface 12 has an exterior
13 facing surface 15, and an opposite interior facing surface 16. As seen
14 in Figure 1, the visual matrix display 10 has a display controller 16
15 which activates individual display elements or pixels to create the
16 desired visual image. The individual pixels will be discussed in greater
17 detail hereinafter. The display controller 20 is capable of receiving data
18 indicative of a message or design and transforming that data into pixel
19 data to selectively activate specific display elements which will
20 hereinafter be described. The display elements provide the desired
21 visual image. The display controller 20 is coupled to a busing system
22 (illustrated graphically by the lines 20) which links the display controller
23 16 to each of the individual display elements of the visual matrix
24 display 10. In the preferred embodiment, the display controller 20 is

1 preferably a microprocessor, but can be any of several means for
2 selectively actuating the display elements such as an application specific
3 integrated circuit (ASIC) or a microcontroller. The display controller
4 20 may also include amplifiers, drivers and the like to insure that a
5 sufficient electrical current is sent to the individual display elements to
6 energize or deenergize same.

7 FIRST FORM

8 The first form of the invention is generally indicated by the
9 numeral 30 in Figure 2 and 13, respectively. As shown in Figure 2,
10 a plurality of apertures 31 are formed in the front panel or surface 12.
11 As illustrated in Figure 1, the apertures are formed in predetermined
12 rows, and columns. As seen most clearly by reference to Figure 2, an
13 electromagnet of conventional design 32 is mounted on the interior
14 facing surface 16 of the front panel 12. The operation of the
15 electromagnet is discussed in detail in the reference to Huber and
16 therefore for purposes of brevity is not discussed in further detail
17 herein. A display element which is generally indicated by the numeral
18 40 is matingly received in the individual apertures 31. The display
19 element 40 of the first form of the invention has a peripheral frame
20 41 which includes individual fastening clips 42 which releasably engage
21 the front panel or surface 12 in the manner of a snap-fit. The
22 peripheral frame 41 also includes opposing exterior facing corners 43.
23 Individual axle bearings 44 are affixed to each of the opposing corners.
24 As illustrated most clearly by reference to Figure 13, a substantially

uniformly retroreflective and translucent lens 50 is fastened or otherwise secured internally of the peripheral frame 41. The translucent lens 30 is formed of colored plastic which is preferably red or orange, although other colors can also be employed. The retroreflective lens 50 includes a forwardly facing lens surface 51, and opposite, rearwardly facing surface 52. The translucent lens is further defined by a peripheral edge 53. As best seen in Figures 4 and 5, a light aperture 54 of predetermined dimensions is formed substantially centrally thereof.

As seen most clearly by reference to Figures 6 and 7, a cube prism pattern, which is generally indicated by the numeral 60 is made integral with the rear surface 52. As best seen in Figure 4, the cube prism pattern has alternating first horizontal rows 61 and second horizontal rows 62 respectively. All of the horizontal rows have multiple uniformly shaped cubes generally indicated by the numeral 63. As will be recognized, only three faces of the cubes 63 are exposed. The cubes 63 are oriented in such a fashion that one corner (represented by the numeral 64) of each of the cube projects outwardly from the planar boundary. The first and second horizontal rows 61 and 62 are slightly offset or staggered from each other. Further, the multiple, uniformly shaped cubes 63 in the first row are aligned relative to their corners 64 along first vertical axes 65. Similarly, the cubes in the second row 62 are aligned relative to their corners 64 along second vertical axes 66. The first rows 61 are also centered on a central axis 67 (which coincides as one of the first vertical axes 65) while the

second rows 62 are arranged symmetrically such that the second vertical axes are parallel to, offset from and centered between adjacent first vertical axes 60.

As an alternative way to describe the cube prism pattern 60, the rear surface 52, of the lens 50, has a multiplicity of uniformly shaped polyhedron cells 70 which have hexagonal bases (when viewed from the rear surface as shown in Figure 3) and parallelogram faces 71. Preferably, the polyhedron cells 70 have 3 parallelogram faces which are most preferably square.

Figures 6 and 7 illustrate the orientation of the uniformly shaped cubes 63 in more detail. As illustrated, the cubes 63 are tilted or angled at angle A to provide the more appropriate orientation to project corners 64 away from the planar boundary 65. Preferably, angle A is approximately 35 degrees. In Figure 7, which is taken through lines 7 - 7 of Figure 6, and parallel to the face of the cube rows, the internal dimensions of each cube 63 are identical and symmetrical. Angle B, which is measured between adjacent faces of adjacent cubes, is preferably 90 degrees. Likewise, angle C, which is measured between adjacent faces of the same cube 63, is preferably 90 degrees. The cubes 63 are oriented in such a manner that angle D is preferably 45 degrees.

This perfectly symmetrical, cube pattern on the rear surface 52 permits light which originates from behind the translucent lens 50 to pass therethrough without significant interference while optimally

1 retroreflecting light which originates from remote locations in front of
2 the retroreflective lens 50. Accordingly, the lens of this invention is
3 significantly brighter than nonretroreflective lenses of conventional design.
4

5 The first form of the invention 30 includes a light source which
6 is generally indicated by the numeral 80. In the first form of the
7 invention, the light source 80 comprises a fiber optic cable 81. The
8 fiber optic cable has a first, light discharging or emitting end 82 which
9 is matingly received and otherwise secured in the light aperture 54.
10 Further, the fiber optic cable has a second, light intake or receiving
11 end 83. As best shown in Figures 8 and 9, an electrically energizable
12 lamp 84, or in the alternative, 85, are mounted in light emitting
13 relation relative to the fiber optic cable 81. In the first form, a single
14 lamp 84 (Fig. 8) is mounted in light emitting relation relative to the
15 second or light receiving end 83 of the fiber optic cable 81. In the
16 second form (Fig. 9), a pair of lamps 85 are mounted in light emitting
17 relation relative to the second or light intake end 83. In each
18 instance, housing 86 fixes the lamp in a given orientation relative to the
19 light receiving end 83 of the fiber optic cable 81. As should be
20 understood, when a pair of lamps are employed (Fig. 9), the housing
21 86 encloses a beam splitting subassembly which allows the lamps to be
22 alternatively energized in the event of a single lamp failure.

23 As shown most clearly by reference to Figure 3, rays of light 90
24 which are emitted by the fiber optic cable 81 escape the fiber optic

1 cable at the light discharging end 82, and are oriented in a direction
2 forwardly of the display element 40 such that the light may be viewed
3 remotely by an observer. As will be recognized, the extreme distal
4 portion of the discharge end of the fiber optic cable is positioned just
5 slightly forward and out of the plane of the forwardly facing surface 51
6 of the retroreflective lens. Therefore, when the retroreflective lens 50
7 is viewed from an observer's position forwardly of the retroreflective
8 lens 50, the retroreflective lens appears substantially uniformly
9 illuminated and further includes a brightly lit substantially centrally
10 disposed area which represents the discharge end 82 of the fiber optic
11 cable 81. This relatively bright light has the overall effect of drawing
12 the attention of an observer in the direction of the visual matrix display
13 10 under poor visibility conditions. Still further, under reduced ambient
14 lighting conditions, a visual matrix display 10 employing the present
15 form of the invention will normally remain visibly discernable under
16 poor visibility conditions in view of the concentrated nature of the light
17 transmitted from the individual fiber optic cables 80. As will be
18 recognized from a study of Figure 3, the retroreflective lens is operable
19 to reflect light originating from locations forward of the display element
20 40 back along substantially parallel courses in the direction of the
21 remote light source or the observer. Therefore, in those instances
22 where the light source 80 is deenergized, as by failure of the power
23 source or some other malfunction, the visual matrix display 10 will
24

1 remain visibly discernable notwithstanding the deenergized state of the
2 light source 80.

3 The first form of the invention 30 includes a flap which is
4 generally indicated by the numeral 100. The flap 100 is pivotally
5 mounted on the frame 41 to selectively cover or expose the
6 retroreflective lens 50. The flap 100 comprises a support member 101
7 and an associated opaque member 102. The opaque member 102 is
8 defined by a peripheral edge 103 that is substantially complementary in
9 size, and shape to that of the retroreflective lens 50. The flap 100
10 further has a forwardly facing surface 104, which is coated with a
11 surface which reduces reflection to a minimum, and has an opposite,
12 rearwardly facing surface 105 which has a retroreflective, opaque surface
13 affixed thereto.

14 As will be recognized, the flap 100 also includes a magnet 110
15 which is fixed on the support member 101, and which works in
16 combination with the electromagnet 32 which is secured on the interior
17 facing surface 16 of the front panel 12. The electromagnet 32
18 selectively cooperates with the magnet 110 to cause the flap 100 to
19 selectively cover, or be displaced from, the retroreflective lens 50. The
20 construction of the electromagnet and the operation of the flap 100
21 caused by the interaction between the electromagnet and magnet are
22 described in detail in U.S. Patent No. 5,111,193 to Huber, et al., the
23 teachings of which are incorporated by reference herein.
24

As best seen by reference to Figure 2, the flap 100 includes a pair of axle pins 111 which are substantially coaxial aligned one with the other, and which are operable to matingly cooperate with the individual axle bearings 44 which are borne by the peripheral frame 41. In this manner, the flap 100 is rendered operable for rotational movement about a pivot axis to selectively cover, or alternatively expose the retroreflective lens 50. As will be recognized, the pins and bearings constitute a preferred embodiment for facilitating the pivotal movement of the flap 100. Additionally, the axle pins and bearings could be reversed such that the pins are mounted in alternative locations such as on the peripheral frame 41 and on the support member 101.

As will be seen by a study of Figures 14 and 15, respectively, the flap 100 is moveable along a given path of travel 112 between a first or occluding position 113 (Fig. 14) wherein the translucent lens 50 is covered, and cannot be observed, and a second or displaced position 114 (Fig. 15) whereby the retroreflective surface 106 can be observed. As will be seen in Figure 13, the flap 100, when located in the second position 114 forms an operational pixel, and any light generated by the light source 80 may escape from the discharge end 82 of the fiber optic cable 81 and may be viewed remotely by an observer from a position which is forward of the display element 40. As will be recognized by a study of Figure 13, the flap 100, and the retroreflective

1 lens 50 each have a given surface area which is about one-half the
2 surface area of the operational pixel.

3 SECOND FORM

4 The second form of the invention is generally indicated by the
5 numeral 130 in Figure 10. As shown in Figures 11, and 12, the second
6 form of the invention 130 includes an aperture 131 which is formed in
7 the front panel 12 and which matingly receives a light source, such as
8 a light emitting diode (LED) 132. A first retroreflective surface 133
9 is borne by the front panel 12 and is positioned adjacent to or in
10 surrounding manner relative to the aperture. The first retroreflective
11 surface 133, which is opaque, will reflect some light emitted from the
12 light emitting diode 132. Therefore, from a remote observer's viewpoint,
13 and when the LED 132 is energized, the first retroreflective surface
14 appears substantially uniformly back lighted when in fact, the light
15 emitted from the LED is escaping the housing 11 without passing
16 through any accompanying translucent lens. Therefore, the apparent
17 luminous area of LED is greatly enhanced without employing light
18 sources which would consume ever increasing levels of electrical power
19 and increased space. A rotatable flap 134 is provided. The flap 134
20 is of similar construction to that earlier disclosed with respect to the
21 first form of the invention 30. Therefore, for purposes of brevity, the
22 rotatable flap 134 is not discussed in further detail herein. As was the
23 case with the flap 100, which was disclosed in the first form of the
24 invention 30, a second retroreflective surface 135 is fixed on the flap

134, and provides approximately one-half of the surface area of the operational pixel. As seen in Figures 11 and 12, the flap 134 is moveable along a path of travel 136 between a first position 137 wherein the pixel is nonoperational, and the flap 134 is disposed in covering relation relative to the first retroreflective surface 133, and the accompanying light source 132; and a second uncovered or displaced position 138 wherein the first and second retroreflective surfaces 133 and 135 can be readily discerned by a remote observer who is located in a position forward of the respective retroreflective surfaces 133, and 135.

As with the first form of the invention 30, the second form of the invention 130 provides an operational pixel which will reflect artificial or ambient light which originates from remote locations, and thus, will continue to be visibly discernable by a remotely positioned observer notwithstanding that the LED 132 is deenergized.

The light emitting diodes 132 utilized in the second form of the invention 130 provide certain unique advantages from the standpoint of energy consumption and the ability to utilize a visual matrix display in environments where reliable sources of electricity may be difficult to access. For example, in view of the relatively low power consumption of light emitting diodes 132, the present visual matrix display 10 may be outfitted with a rechargeable battery pack, and an accompanying solar panel which will recharge the battery pack thereby providing a convenient means to provide a visibly discernable visual matrix display

1 in remote locations where electricity is not normally available. Still
2 further, it will be recognized that the earlier disclosed light source
3 employed the first form of the invention and which includes a fiber
4 optic cable, and accompanying lamps may be substituted in place of the
5 LED with equal success. Still further, the use of LEDs 132 provides
6 advantages from the standpoint of allowing the visual matrix displays 10
7 to be manufactured which have a thinner profile than what has been
8 possible heretofore.

9 10 THIRD FORM

11 The third form of the invention is generally indicated by the
12 numeral 140 in Figure 16. As shown therein, the third form of the
13 invention is very similar to the second form of the invention 130, but
14 has some notable differences. More particularly, the third form of the
15 invention includes two pairs of apertures, a first pair 141, and a second
16 pair 142 respectively. The individual pairs of apertures are located in
17 predetermined spaced relation one to the other. Each of the apertures
18 matingly receives individual light emitting diodes (LEDs) 143. Further,
19 as shown in Figure 16, a first retroreflective surface 144 is positioned
20 adjacent to the first pair of apertures 141. The third form of the
21 invention 140 also includes a rotatable flap 145 which is similar in
22 construction to the first form of the invention 30. A second
23 retroreflective surface 146 is affixed on the rotatable flap 145. As will
24 be seen in Figures 16 and 17, a third pair of apertures 147 are formed

1 in predetermined locations in the rotatable flap. The rotatable flap 145
2 is moveable along a given path of travel 150 between a first position
3 151, wherein the flap is disposed in covering relation relative to the
4 first retroreflective surface 144; and a second position 152, where it is
5 displaced therefrom. As will be recognized, the second pair of
6 apertures 147 are formed in a predetermined position in the rotatable
7 flap such that when the rotatable flap 145 is oriented in the first
8 position 151, the third pair of apertures 147 are substantially coaxially
9 aligned with the first pair of apertures 141. Further, when the
10 rotatable flap 145 is located in the second position 152, the third pair
11 of apertures are substantially coaxially aligned relative to the second
12 pair of apertures 142. As will be recognized, in either the first or
13 second positions, the individual light emitting diodes 143 remain exposed.
14 Light may escape, therefore, from the light emitting diodes and be seen
15 by a remotely positioned observer when the LEDs are energized.

16 The third form of the invention provides three distinctive modes
17 of operation. In this regard, the first mode of operation 160 is shown
18 in Figure 18A. In this first mode of operation, the rotatable flap 145
19 is located in the second position 152, whereby it forms an operational
20 pixel. Further, the individual LEDs 143 which are oriented in light
21 emitting relation relative to the first and second pairs of apertures 141
22 and 142, respectively are energized. In the second mode of operation
23 which is generally indicated by the numeral 170 in Figure 18B, the
24 rotatable flap 145 is located in the first position 151, that is, in

substantially covering relation relative to the first retroreflective surface 144; and the individual LEDs 143 are energized. Finally, in the third mode of operation 180 which is shown in Figure 18C, the rotatable flap 145 is located in the second position 152, and the individual LEDs, 143 are deenergized.

As will be recognized, the third form of the invention 140 provides increased design capability for operators of such visual matrix displays 10.

OPERATION

The operation of the described forms of the present invention are believed to be readily apparent and are briefly summarized at this point.

A pixel for use in a visual matrix display 10 is best seen by reference to Figures 10, 13, and 16, respectively. As shown therein, the pixel for use in a visual matrix display 10 includes a frame 12 having front and rear surfaces 15 and 16, respectively, and defining an aperture 31, 54, 131, 141, and 142; a light source 80, 132, and 143, oriented in the aperture; a first retroreflective surface 50, 133, and 144, borne by the frame and positioned adjacent to the aperture; a flap 100, 134 and 145 borne by the front surface and moveable along a given path of travel 112, 136, and 150, between a first position 113, 137, and 151, wherein the pixel is nonoperational, and the flap is disposed in covering relation to the light source, and the first retroreflective surface, to a

second operational position 114, 138, and 152, and wherein the flap has a second retroreflective surface 106, 135, and 146, which is exposed when the flap is in the second operational position; means borne by the frame 32 for selectively moving the flap along the given path of travel; and means for energizing the light source 20 when the flap is in one of the given positions along the path of travel.

More specifically, another aspect of the present invention relates to a first form of the invention which includes a pixel for use in a visual matrix display 10 including, a frame 12 having front and rear surfaces 15 and 16, and defining an aperture 31; a translucent, substantially planer retroreflective lens 50 borne by the frame and oriented in substantially occluding relation relative to the aperture, the translucent retroreflective lens further defining a substantially centrally disposed light emitting aperture 54; a fiber optic cable received in the light emitting aperture, the fiber optic cable having a light receiving end 83, and an opposite light discharging end 82; a source of light 84 and 85, positioned in light emitting relation relative to the light receiving end of the fiber optic cable; a flap 100 borne by the front surface of the frame and moveable along a given path of travel 112 between a first position 113, wherein the flap occludes the aperture and is in covering relation relative to the light discharging end of the fiber optic cable, to a second position 114, wherein the flap is oriented in a nonoccluding position relative to the light discharging end of the fiber optic cable, and wherein the flap 100 has a retroreflective surface 106

1 which is exposed when the flap is oriented in the second position, and
2 wherein the retroreflective surface of the flap and the translucent lens
3 form an operational pixel; means borne by the frame for moving the
4 flap along the given path of travel 32 between the first and second
5 positions; and means for selectively energizing the light source when the
6 flap is in the second position 20 the light produced by the light source
7 emitted from the light discharging end of the fiber optic cable.

8 Still another aspect of the present invention includes a pixel for
9 use in a visual matrix display 10 which includes a frame 12 having
10 front and rear surfaces 15 and 16, and defining an aperture 131; a
11 light source 132 mounted in the aperture; a first, opaque retroreflective
12 surface 133 borne by the frame and oriented in an adjacent location
13 relative to the light source; a flap 134 pivotally borne by the frame
14 and moveable along a given path of travel 136 from a first position
15 137, wherein the flap is disposed and substantially covering relation
16 relative to the first retroreflective surface, and the light source, and a
17 second position 138, wherein the flap is oriented in a displaced position
18 relative to the first retroreflective surface and the light source, and
19 wherein the flap has a second retroreflective surface 135 which is
20 exposed when the flap is oriented in the second position, the first and
21 second retroreflective surfaces forming an operational pixel when the
22 flap is in the second position; means borne by the frame for moving
23 the flap 32 along the given path of travel; and means borne by the
24

1 frame for energizing the light source 20 when the flap is in the second
2 position.

3 Still a further aspect of the present invention includes a pixel for
4 use in a visual matrix display 10 comprising a frame 12 defining first
5 and second apertures 141 and 142, respectively, a light source 143
6 mounted in each of the first and second apertures; a first, opaque
7 retroreflective surface 144 borne by the frame and positioned adjacent
8 the first aperture; a pivotally moveable flap 145 borne by the frame
9 and moveable along a given course of travel 150, the flap having a
10 second retroreflective surface 146, and further defining a third aperture
11 147, which is positioned in a predetermined orientation, and wherein the
12 flap is moveable from a first position 151, wherein the flap is oriented
13 in substantially covering relation relative to the first retroreflective
14 surface, and the third aperture is substantially coaxially aligned relative
15 to the first aperture, and a second position 152, wherein the flap is
16 displaced relative to the first aperture, and wherein the flap in the
17 second position exposes the second retroreflective surface and the third
18 aperture is oriented in substantially coaxial alignment relative to the
19 second aperture; means borne by the frame for moving the flap along
20 the given path of travel 32 from the first to the second position; and
21 means coupled with each of the light sources for selectively energizing
22 the respective light sources 20 when the flap is in the first and second
23 positions.
24

As will be seen the first 30, second 130, and third 140 forms of the invention provide a convenient means whereby a visual matrix display 10 can be employed in remote locations to provide all manner of predetermined visual indicia which may be viewed remotely by an observer under diminished lighting conditions or under environmental conditions which detract from the visibility of same.

In compliance with the statute, the invention has been described in language more or less specific as to structural and methodical features. It is to be understood, however, that the invention is not limited to the specific details described, since the means herein disclosed comprise preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the proper scope of the appended claims appropriately interpreted in accordance with the Doctrine of Equivalents.

CLAIMS:

1. A pixel for use in a visual matrix display comprising:
a frame having front and rear surfaces, and defining an aperture;
a light source oriented in the aperture;
a first retroreflective surface borne by the frame and positioned adjacent to the aperture;

a flap borne by the front surface and moveable along a given path of travel between a first position wherein the pixel is nonoperational, and the flap is disposed in covering relation relative to the light source, and the first retroreflective surface, to a second operational position, and wherein the flap has a second retroreflective surface which is exposed when the flap is oriented in the second position;

means borne by the frame for selectively moving the flap along the given path of travel; and

means for energizing the light source when the flap is in one of the given positions along the path of travel.

2. A pixel as claimed in claim 1, wherein the first retroreflective surface is a substantially uniformly translucent retroreflective lens, and wherein the translucent lens is borne by the frame, and the aperture is formed in the translucent lens.

1 3. A pixel as claimed in claim 1, wherein the first
2 retroreflective surface is opaque, and wherein the first retroreflective
3 surface surrounds the aperture.

4
5 4. A pixel as claimed in claim 1, wherein the first
6 retroreflective surface has a given surface area, and wherein the flap
7 has a given surface area which is at least as great as the surface area
8 of the first retroreflective surface.

9
10 5. A pixel as claimed in claim 1, wherein the light source
11 comprises a fiber optic cable received in the aperture, the fiber optic
12 cable having a light receiving end, and an opposite, light discharging
13 end, and wherein the light discharging end is received in the aperture,
14 and wherein the light source is mounted in light emitting relation
15 relative to the light receiving end of the fiber optic cable.

16
17 6. A pixel as claimed in claim 1, wherein the light source is
18 a light emitting diode.

19
20 7. A pixel as claimed in claim 1, wherein the frame includes
21 a second aperture, and a third aperture is formed in the flap, and
22 wherein a second light source is oriented in the second aperture, and
23 wherein the flap when oriented in the first position locates the third
24 aperture in substantially coaxial alignment relative to the first aperture,

and wherein the flap when oriented in the second position locates the third aperture in substantially coaxial alignment relative to the second aperture, and wherein the means for energizing the light source operates to selectively energize the light source when the flap is in the first and second positions.

8. A pixel as claimed in claim 1, wherein the first retroreflective surface is a translucent lens, and wherein the aperture is formed in the translucent lens, and wherein the light source oriented in the aperture comprises a fiber optic cable which has a light receiving end, and an opposite light discharge end, and wherein the light source is mounted in light emitting relation relative to the light receiving end of the fiber optic cable, and wherein the flap when located in the second position defines an operational pixel which is substantially uniformly retroreflective, the retroreflective lens retroreflecting light striking the retroreflective lens and which originates from locations in front of the retroreflective lens, the operational pixel, under conditions of darkness, and in a deenergized state, reflecting artificial light striking the retroreflective surface of the flap, and the retroreflective lens such that the pixel remains visibly discernible notwithstanding the deenergized state of the light source.

9. A pixel as claimed in claim 1, wherein the frame includes a second aperture, and a third aperture is formed in the flap, and

wherein a second light source is oriented in the second aperture, and wherein the flap when oriented in the first position locates the third aperture in substantially coaxial alignment relative to the first aperture, and wherein the flap, when oriented in the second position, orients the third aperture in substantially coaxial alignment relative to the second aperture, and wherein the means for energizing the light source selectively operates to energize the light source when the flap is in the first and second positions, and wherein the pixel has first, second and third modes of operation, and wherein during the first mode of operation the flap is disposed in the second position, and each of the light sources are energized, and wherein during the second mode of operation the flap is in the first position, and each of the light sources are energized, and wherein during the third mode of operation the flap is in the second position and each of the light sources are deenergized.

10. A pixel for use in a visual matrix display, comprising:

a frame having front and rear surfaces, and defining an aperture;

a translucent, substantially planar, retroreflective lens borne by the frame and oriented in substantially occluding relation relative to the aperture, the retroreflective lens further defining a substantially centrally disposed light emitting aperture;

a fiber optic cable received in the light emitting aperture, the fiber optic cable having a light receiving end, and an opposite, light discharging end;

1 a source of light positioned in light emitting relation relative to
2 the light receiving end of the fiber optic cable;

3 a flap borne by the front surface of the frame and moveable
4 along a given path of travel between a first position, wherein the flap
5 occludes the aperture, and is in covering relation relative to the light
6 discharging end of the fiber optic cable, to a second position, wherein
7 the flap is oriented in a nonoccluding position relative to the light
8 discharging end of the fiber optic cable, and wherein the flap has a
9 retroreflective surface which is exposed when the flap is oriented in the
10 second position, and wherein the retroreflective surface of the flap and
11 the translucent lens form an operational pixel;

12 means borne by the frame for moving the flap along the given
13 path of travel between the first and second positions; and

14 means for selectively energizing the light source when the flap is
15 in the second position, the light produced by the light source emitting
16 from the light discharging end of the fiber optic cable.

17
18 11. A pixel as claimed in claim 10, wherein the retroreflective
19 lens has a forwardly facing surface, and an opposite, rearwardly facing
20 surface, and wherein the rearwardly facing surface of the retroreflective
21 lens has a plurality of uniformly spaced polyhedron cells having
22 hexagonal bases, and parallelogram faces.

1 12. A pixel as claimed in claim 10, wherein the flap and the
2 retroreflective lens each have a given surface area which is about one-
3 half the surface area of the operational pixel.

4
5 13. A pixel as claimed in claim 10, wherein the operational
6 pixel, under conditions of darkness, reflects artificial light striking the
7 retroreflective surface of the flap, and the retroreflective lens, such that
8 the pixel remains visibly discernible.

9
10 14. A pixel for use in a visual matrix display, comprising:
11 a frame having front and rear surfaces, and defining an aperture;
12 a light source mounted in the aperture;
13 a first, opaque retroreflective surface borne by the frame and
14 oriented in an adjacent location relative to the light source;
15 a flap pivotally borne by the frame and moveable along a given
16 path of travel from a first position, wherein the flap is disposed in
17 substantially covering relation relative to the first retroreflective surface,
18 and the light source, and a second position wherein the flap is oriented
19 in a displaced position relative to the first retroreflective surface, and
20 the light source, and wherein the flap has a second retroreflective
21 surface which is exposed when the flap is disposed in the second
22 position, the first and second retroreflective surfaces forming an
23 operational pixel when the flap is in the second position;
24

means borne by the frame for moving the flap along the given path of travel; and

means borne by the frame for energizing the light source when flap is in the second position.

15. A pixel as claimed in claim 14, wherein the retroreflective surface and the flap each have a given surface area which is about one-half the surface area of operational pixel.

16. A pixel as claimed in claim 14, wherein the light source is a light emitting diode.

17. A pixel as claimed in claim 14, wherein the light source comprises a fiber optic cable mounted in the aperture and which has a first light discharging end, and an opposite light intake end, and wherein the light source is mounted in light emitting relation relative to the light intake end of the fiber optic cable.

18. A pixel as claimed in claim 14, wherein the operational pixel is substantially uniformly retroreflective, the retroreflective surfaces of the operational pixel retroreflecting light which originates from locations in front of the the respective retroreflective surfaces, the operational pixel under conditions of darkness, and in a deenergized state, reflecting artificial light striking the retroreflective surfaces such

that the pixel remains visibly discernible notwithstanding the deenergized state of the light source.

19. A pixel for use in visual matrix display, comprising:

a frame defining first and second apertures;

a light source mounted in each of the first and second apertures;

a first, opaque retroreflective surface borne by the frame and positioned adjacent the first aperture;

a pivotally moveable flap borne by the frame and moveable along a given course of travel, the flap having a second retroreflective surface, and further defining a third aperture which is positioned in a predetermined orientation, and wherein the flap is moveable from a first position wherein the flap is oriented in substantially covering relation relative to the first retroreflective surface, and the third aperture is substantially coaxially aligned relative to the first aperture, and a second position wherein the flap is displaced relative to the first aperture, and wherein the flap, in the second position, exposes the second retroreflective surface, and the third aperture is oriented in substantially coaxially alignment relative to the second aperture;

means borne by the frame for moving the flap along the given path of travel from the first to the second positions; and

means coupled with each of the light sources for selectively energizing the respective light sources when the flap is in the first and second positions.

20. A pixel as claimed in claim 19, wherein the light sources comprise light emitting diodes.

21. A pixel as claimed in claim 19, wherein the light sources comprise a fiber optic cable which has a first, light discharging end, and an opposite light receiving end, and wherein the light discharging end is mounted in substantially occluding relation relative to the respective apertures, and wherein the light sources are mounted in light emitting relation relative to the light receiving end of the fiber optic cable.

22. A pixel as claimed in claim 19, wherein the first retroreflective surface and the flap each have a given surface area which is about one-half the surface area of the operational pixel.

23. A pixel as claimed in claim 19, wherein pixel has first, second and third modes of operation, and wherein during the first mode of operation the flap is disposed in the second position and the respective light sources are energized, and wherein during the second mode of operation the flap is in the first position and the light sources

are energized, and wherein during the third mode of operation the flap is in the second position and the light sources are deenergized.

24. A pixel as claimed in claim 19, wherein the operational pixel, under conditions of darkness, reflects artificial light striking the retroreflective surfaces of the pixel such that the pixel remains visibly discernible.

1 ABSTRACT OF THE DISCLOSURE

2 A pixel for use in a visual matrix display including a frame
3 having front and rear surfaces and defining an aperture; a light source
4 oriented in the aperture; a first retroreflective surface borne by the
5 frame and positioned adjacent to the aperture; a flap borne by the
6 front surface and moveable along a given path of travel between a first
7 position wherein the pixel is nonoperational, and the flap is disposed
8 in covering relation relative to the light source, and a second
9 operational position, wherein the flap has a second retroreflective
10 surface which is exposed when the flap is in the second position; means
11 borne by the frame for moving the flap along the given path of travel;
12 and means for energizing the light source when the flap is in one of
13 the given positions along the path of travel.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Priority Application Serial No. 09/087,765
Priority Filing Date May 29, 1998
Inventor Jerry L. Johnson et al.
Assignee American Electronic Design Company
Priority Group Art Unit 2775
Priority Examiner C. Nguyen
Attorney's Docket No. AM19-013
TITLE: Display Element Having Retroreflective Surface (As amended herein)

Assistant Commissioner for Patents
Washington, D. C. 20231
Attention: Official Draftsman

SUBSTITUTE DRAWING REQUEST

Please enter the enclosed substitute drawings in the above-referenced application in place of drawings originally filed. The content of the drawings are identical to those now on file in this application.

Acknowledgment of receipt of the formal drawings and their acceptance into the file is requested.

Respectfully submitted,

Date: Oct 12, 2000

By: 

George G. Grigel
Reg. No.: 31,166

WELLS, ST. JOHN, ROBERTS,
GREGORY & MATKIN P.S.
601 W. First Avenue, Suite 1300
Spokane, WA 99201-3828
(509) 624-4276

Enclosures: 14 Sheets of Formal Drawings, Figs. 1-20.

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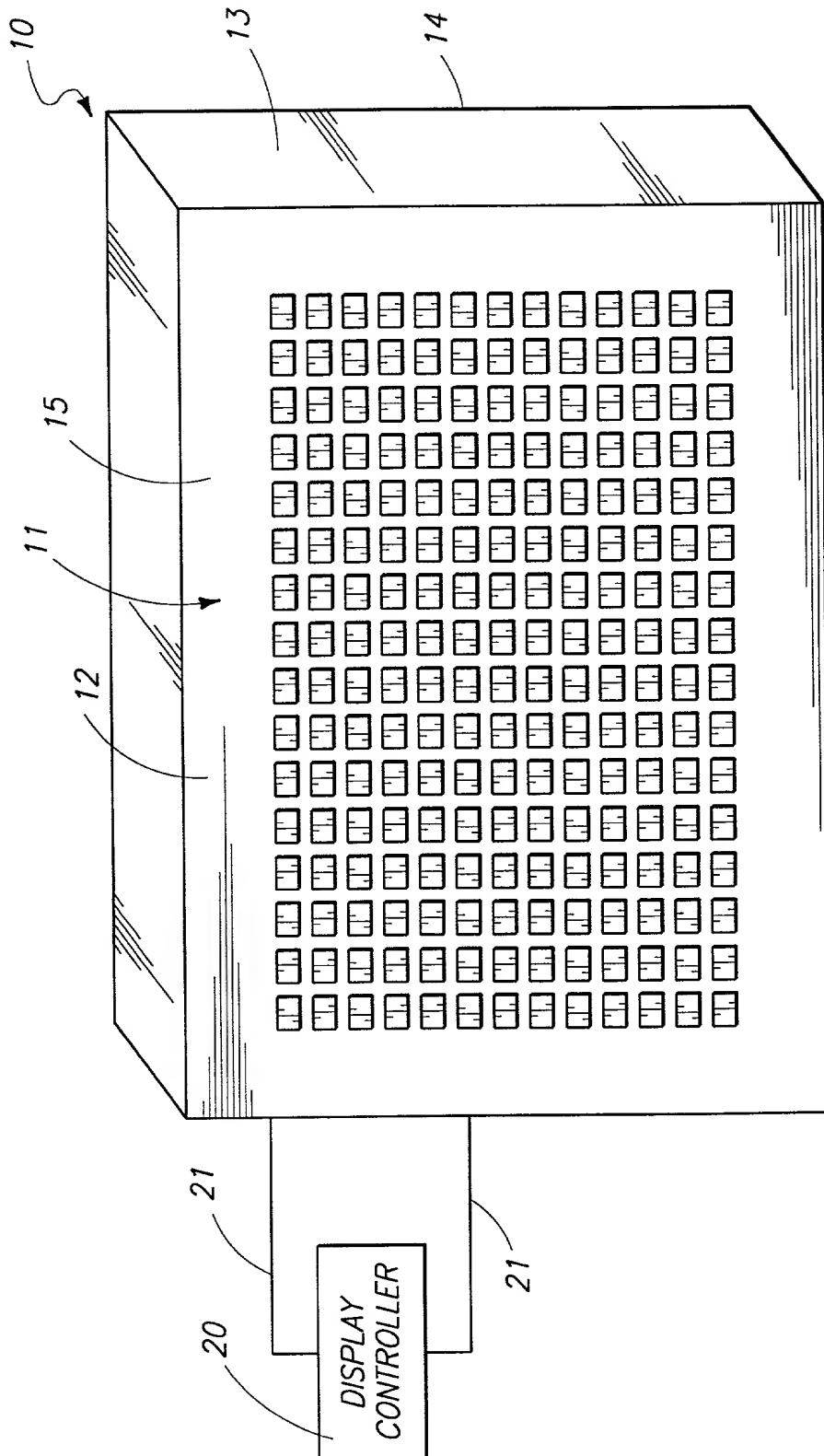
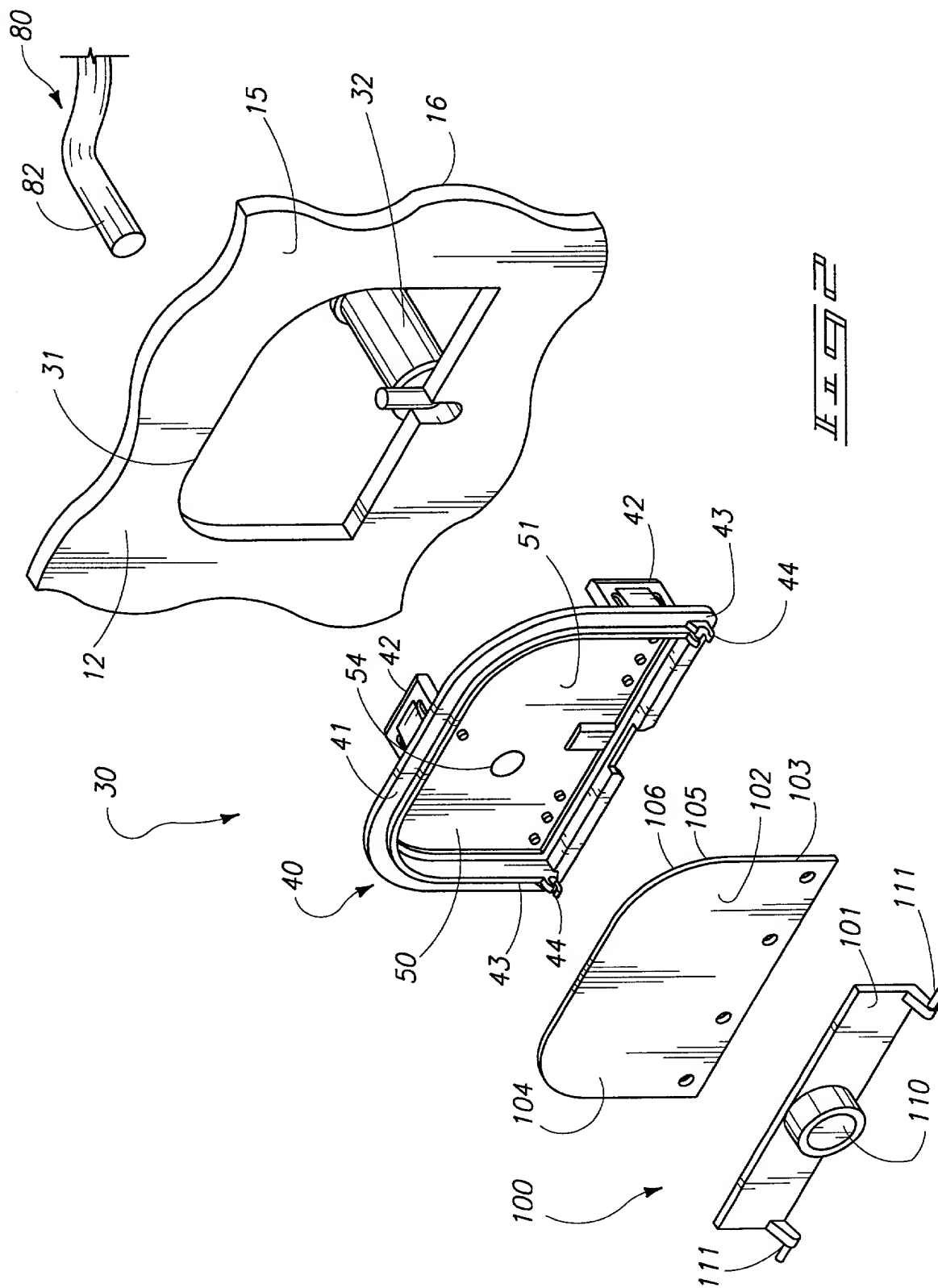


Fig. 1

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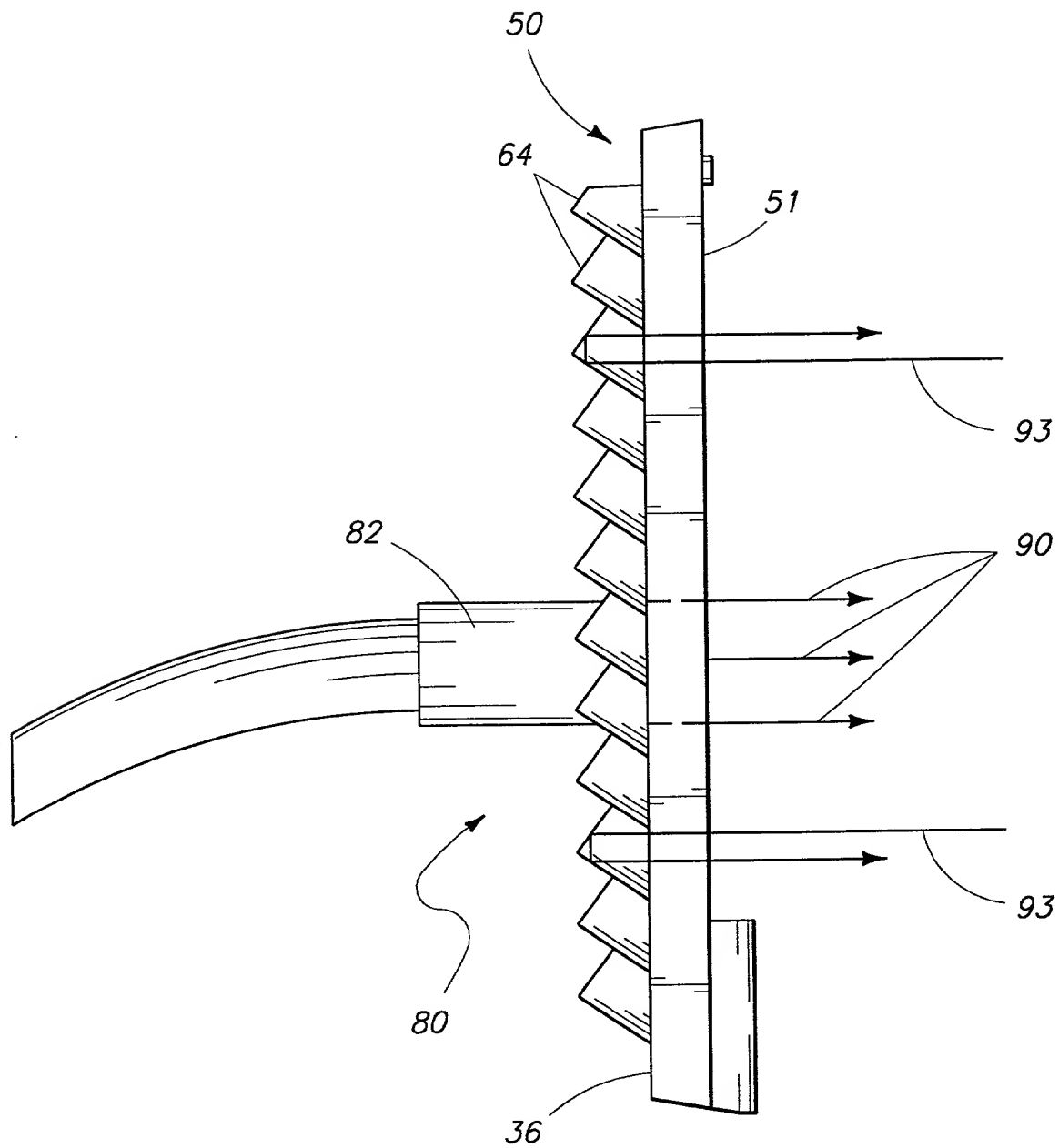
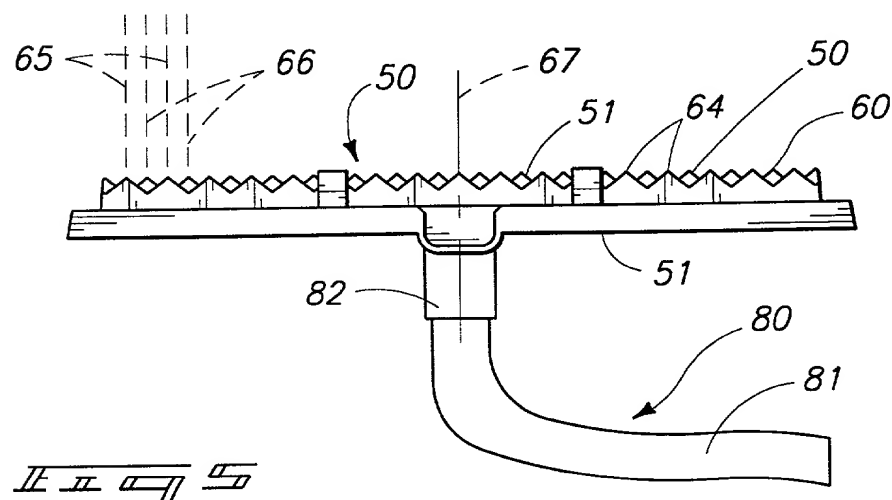
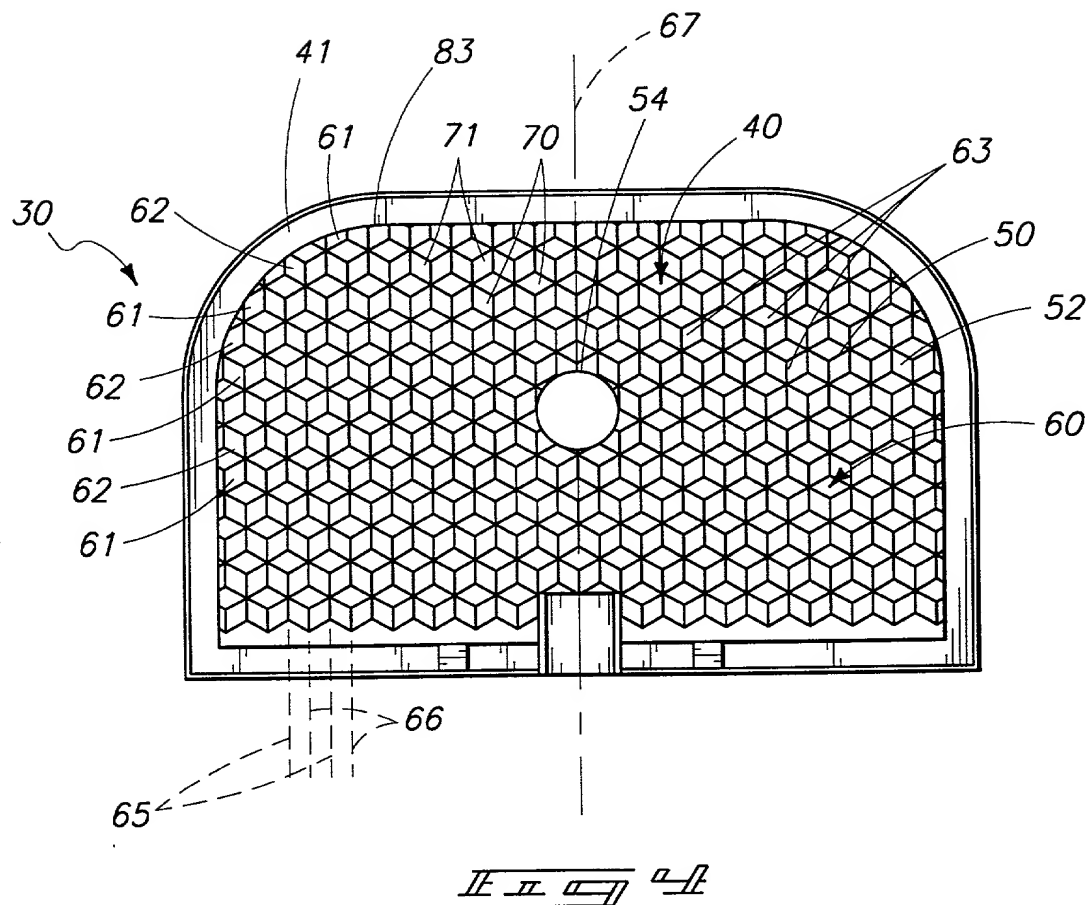


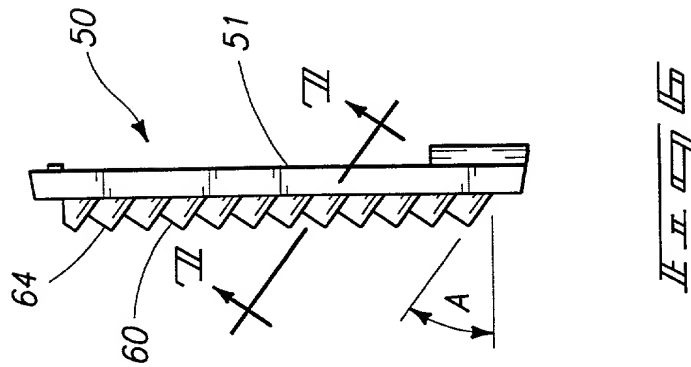
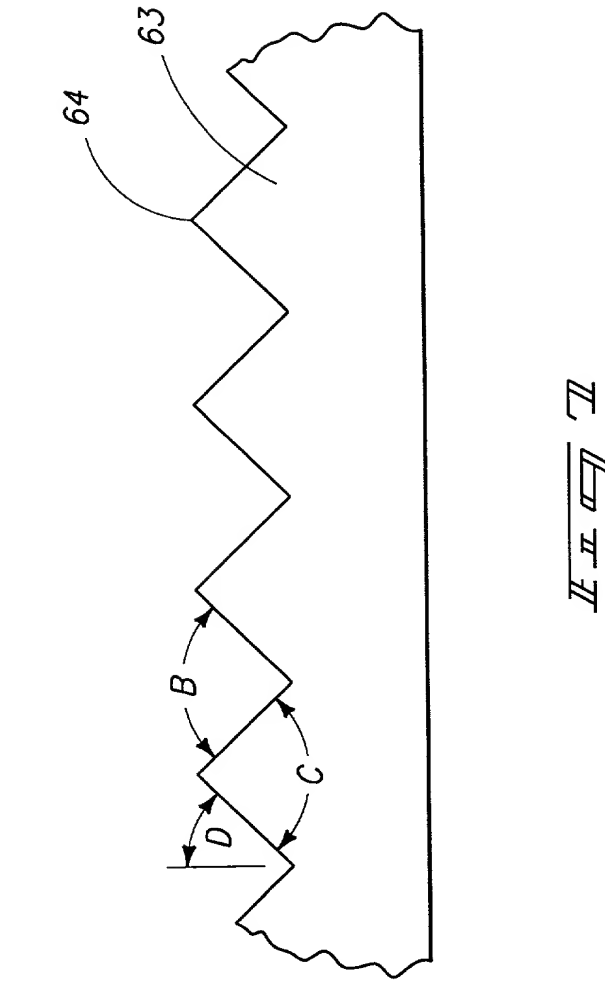
FIG. 3

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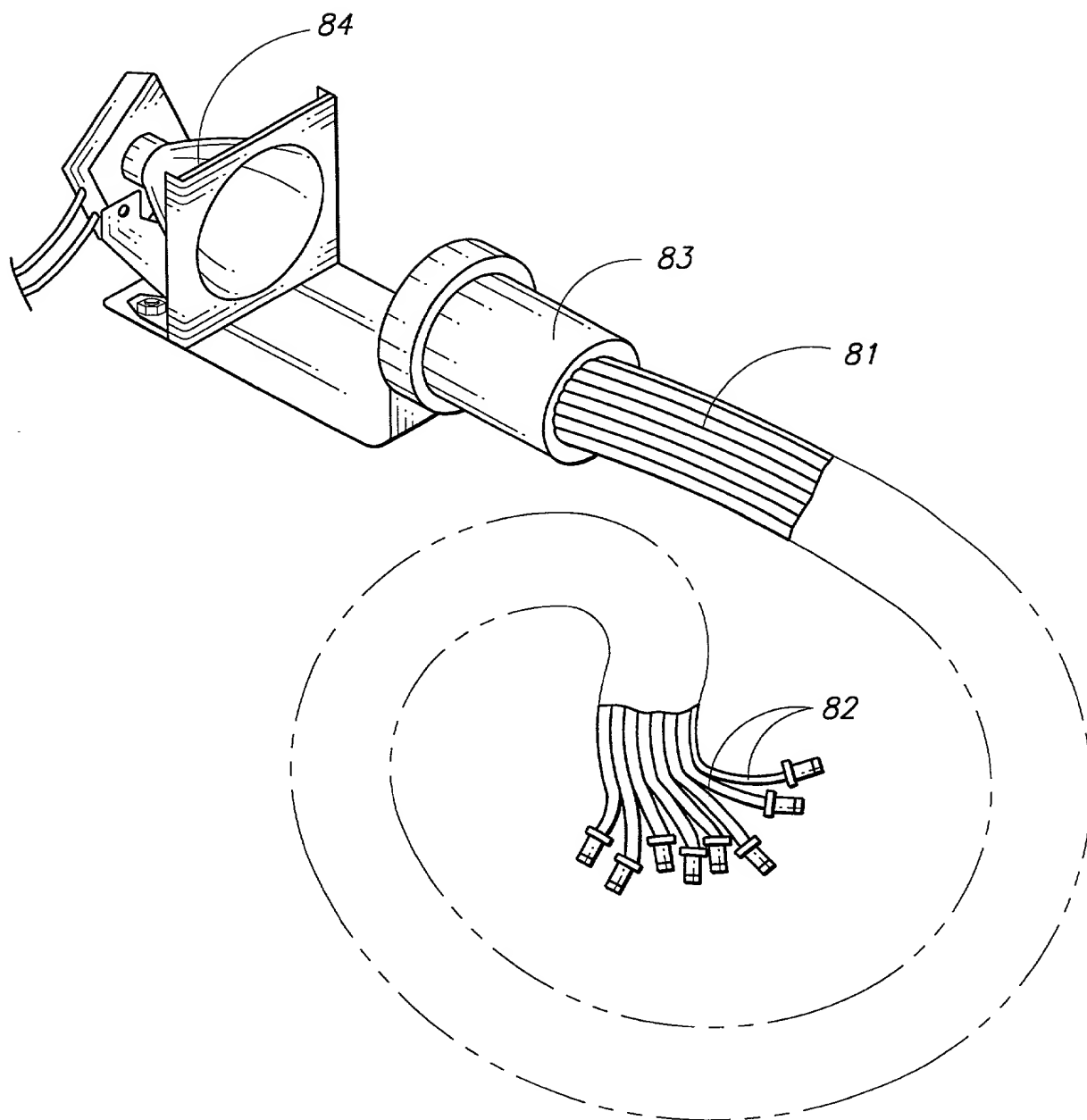
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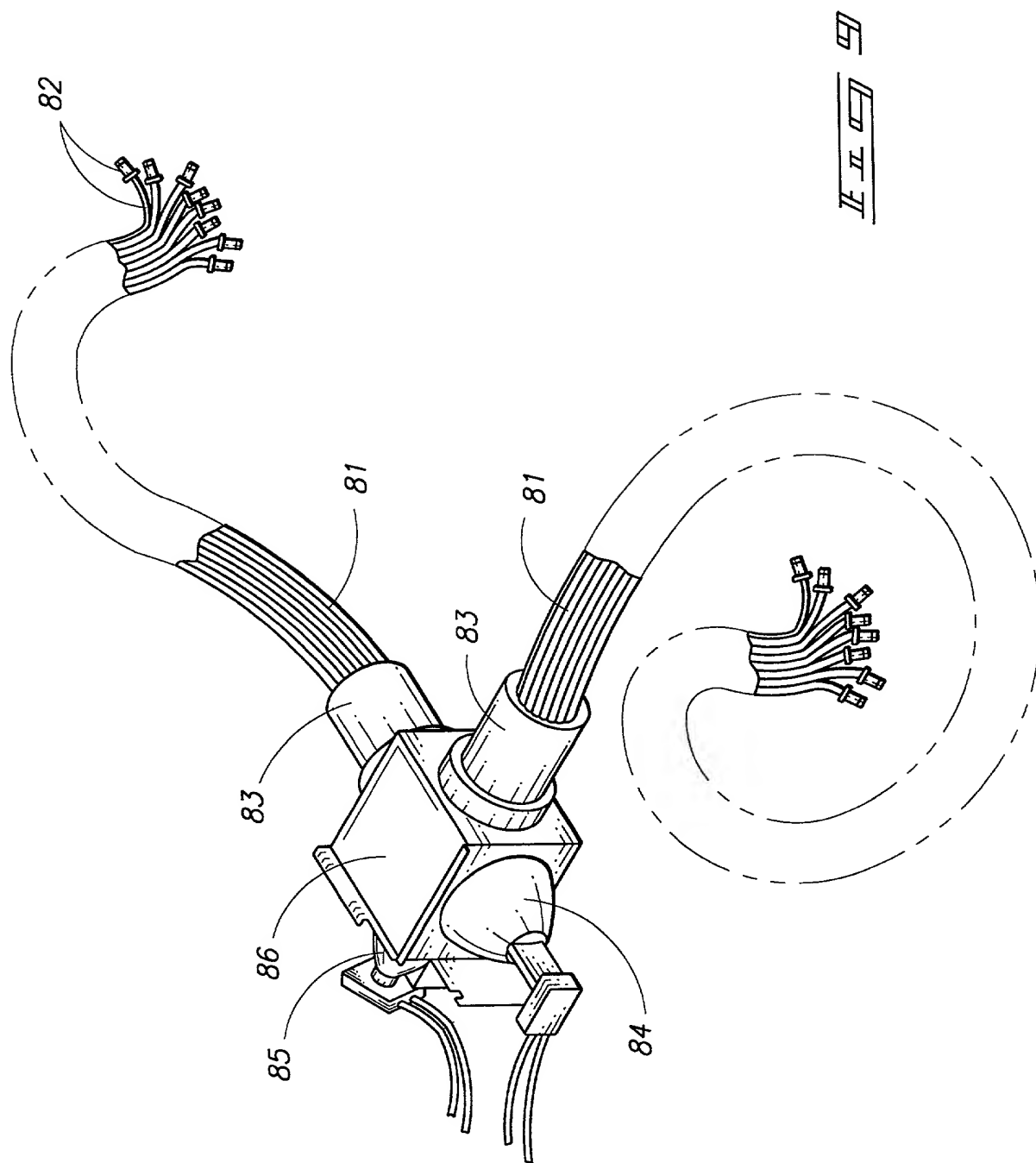
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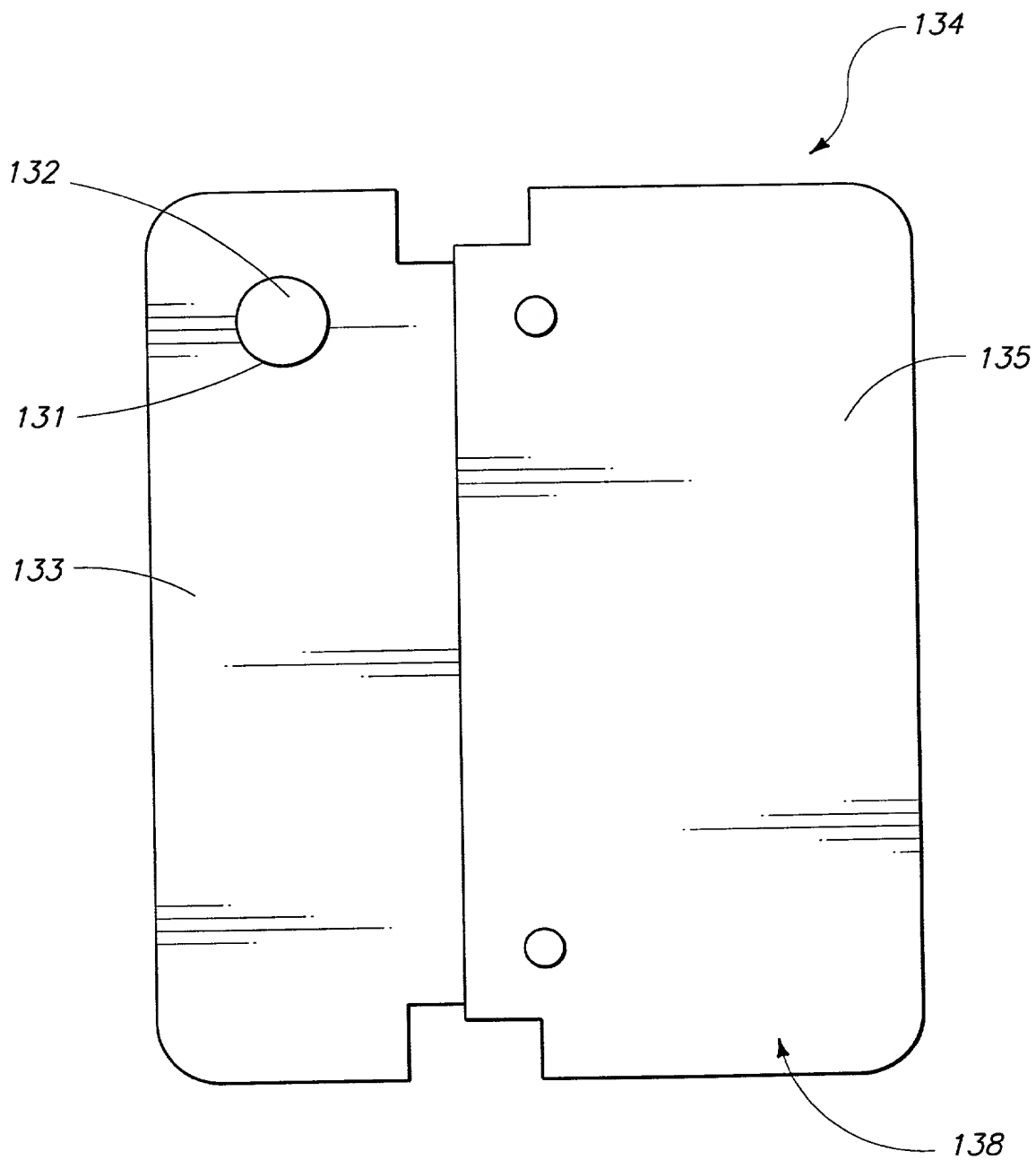
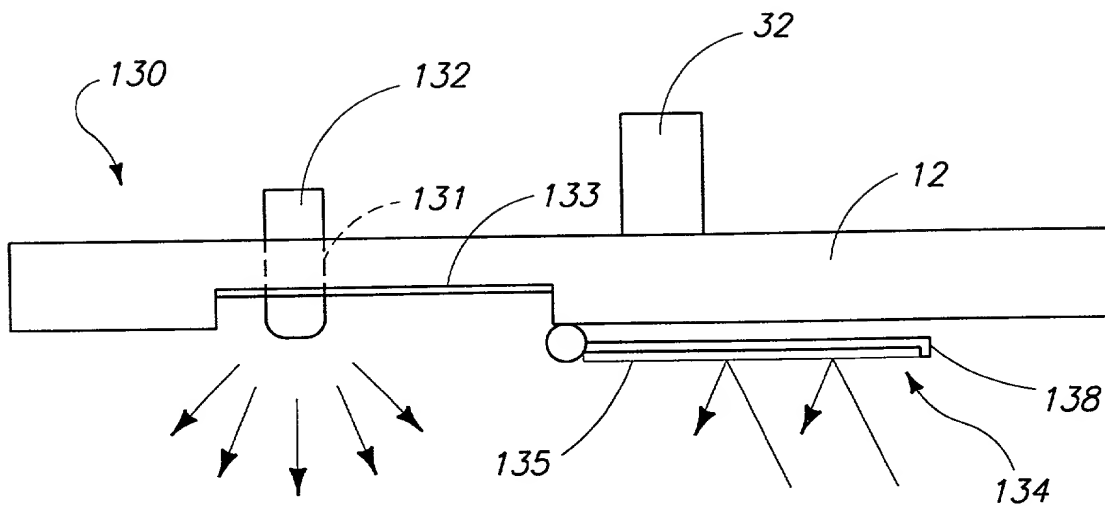
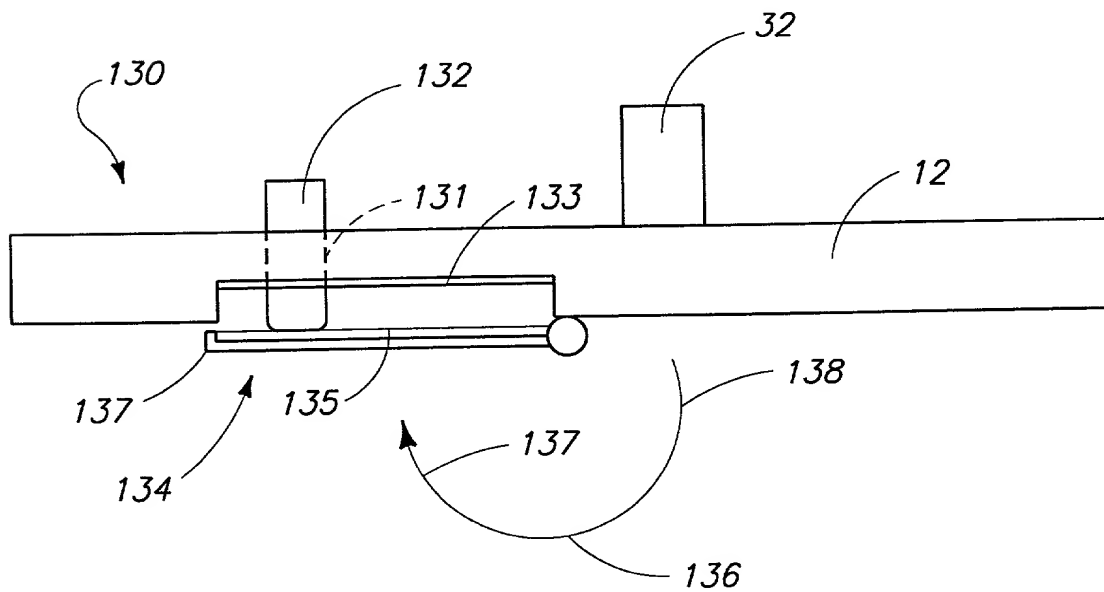


FIG. 10

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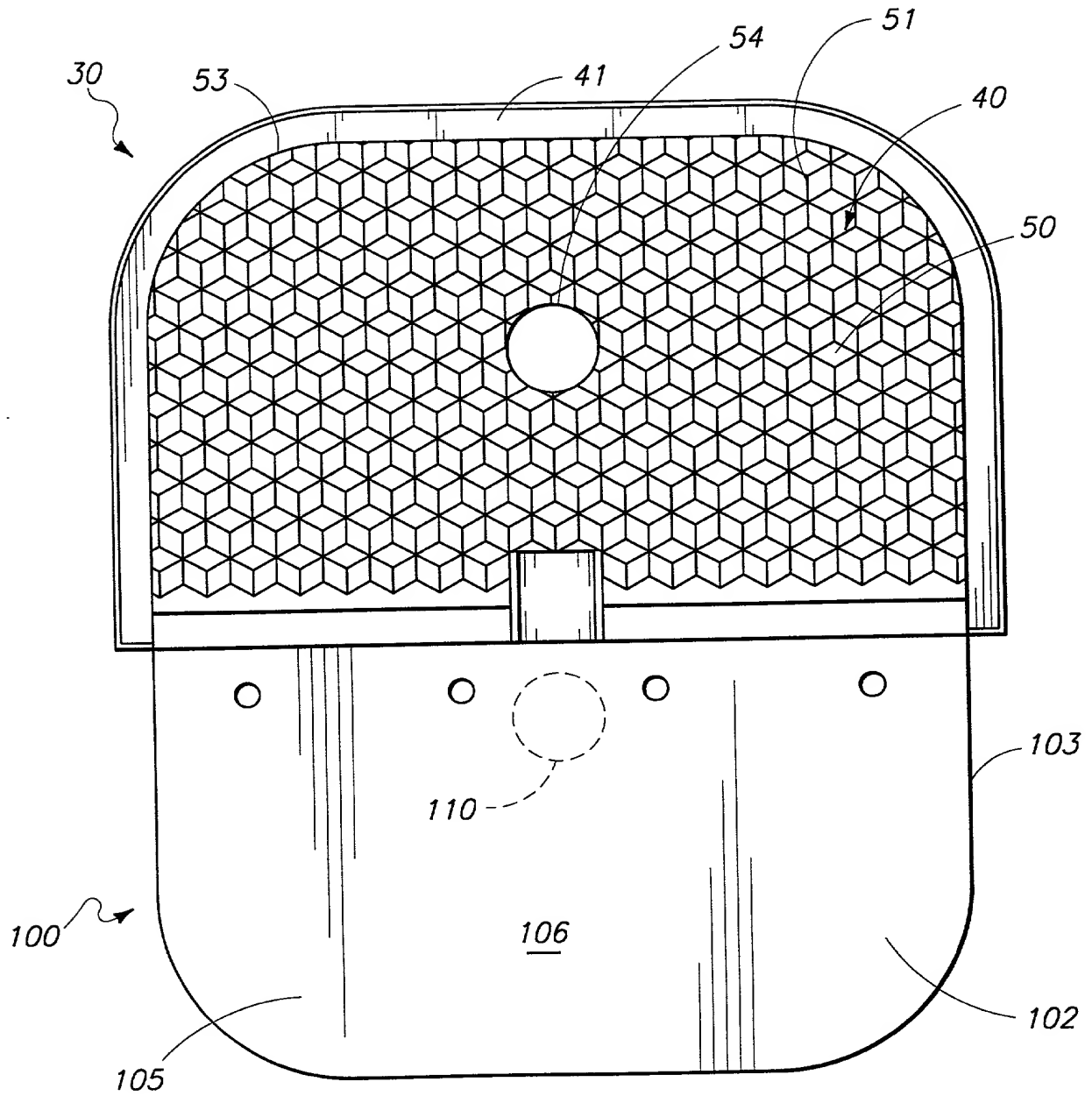


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SUBSTITUTE

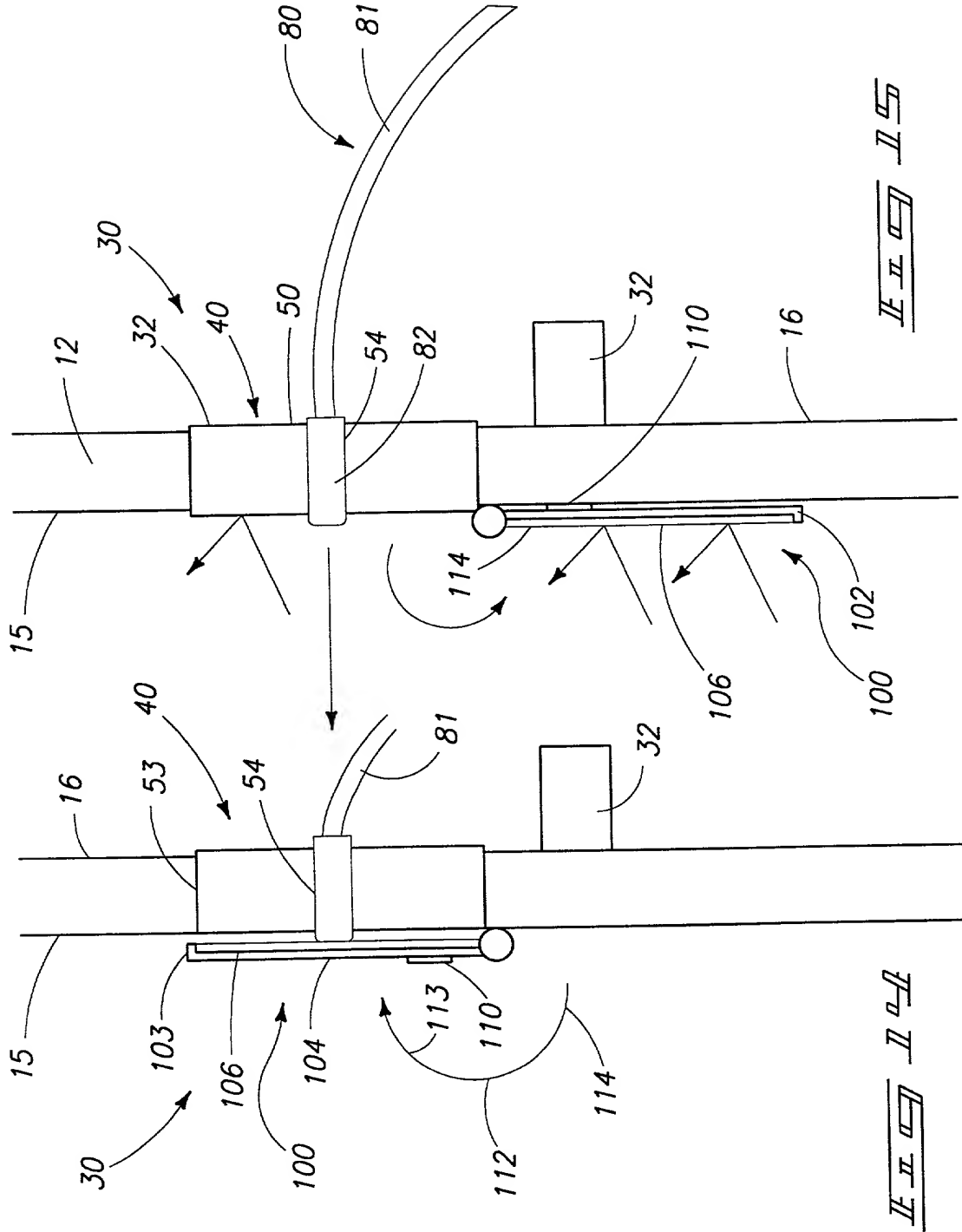
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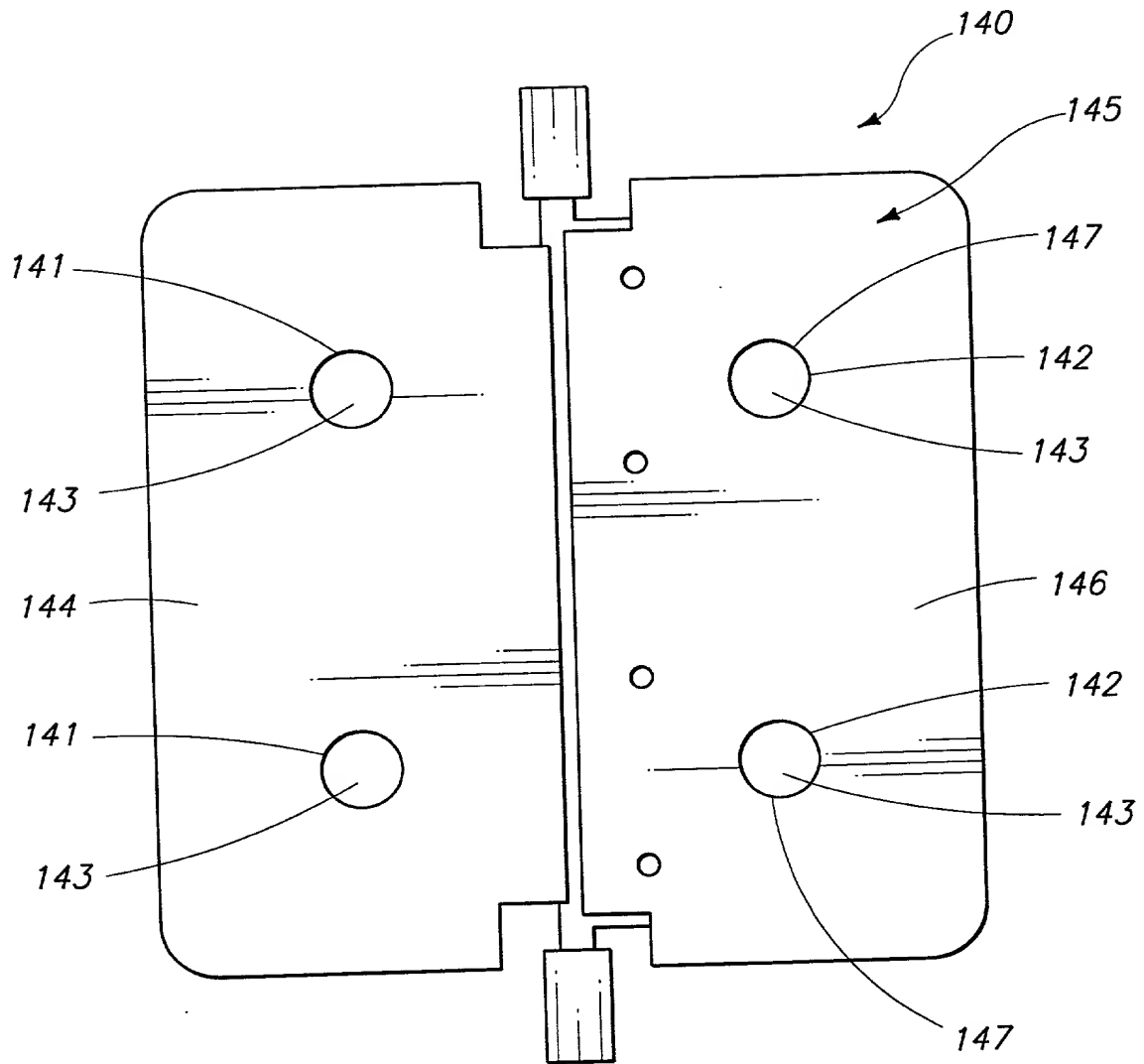
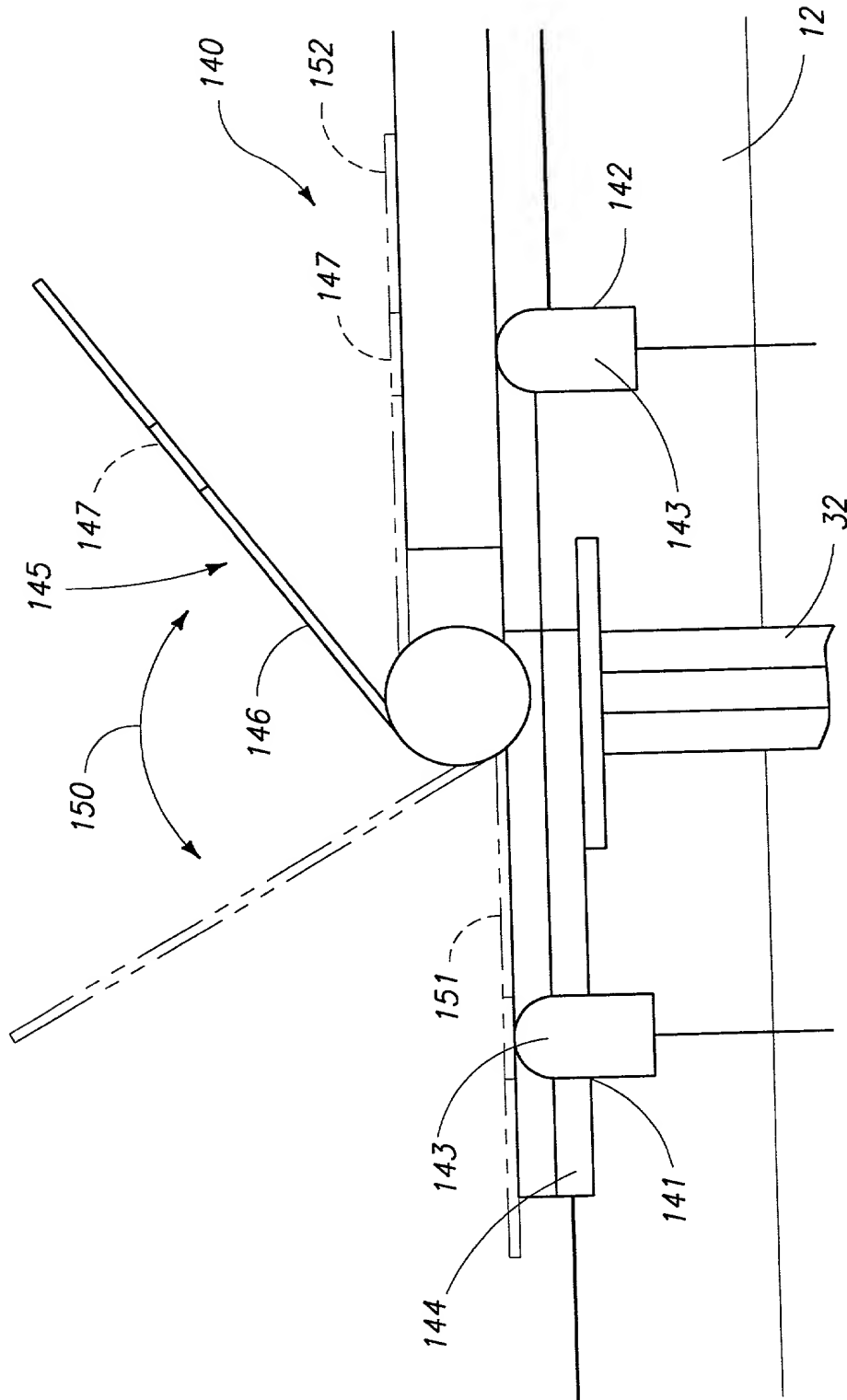
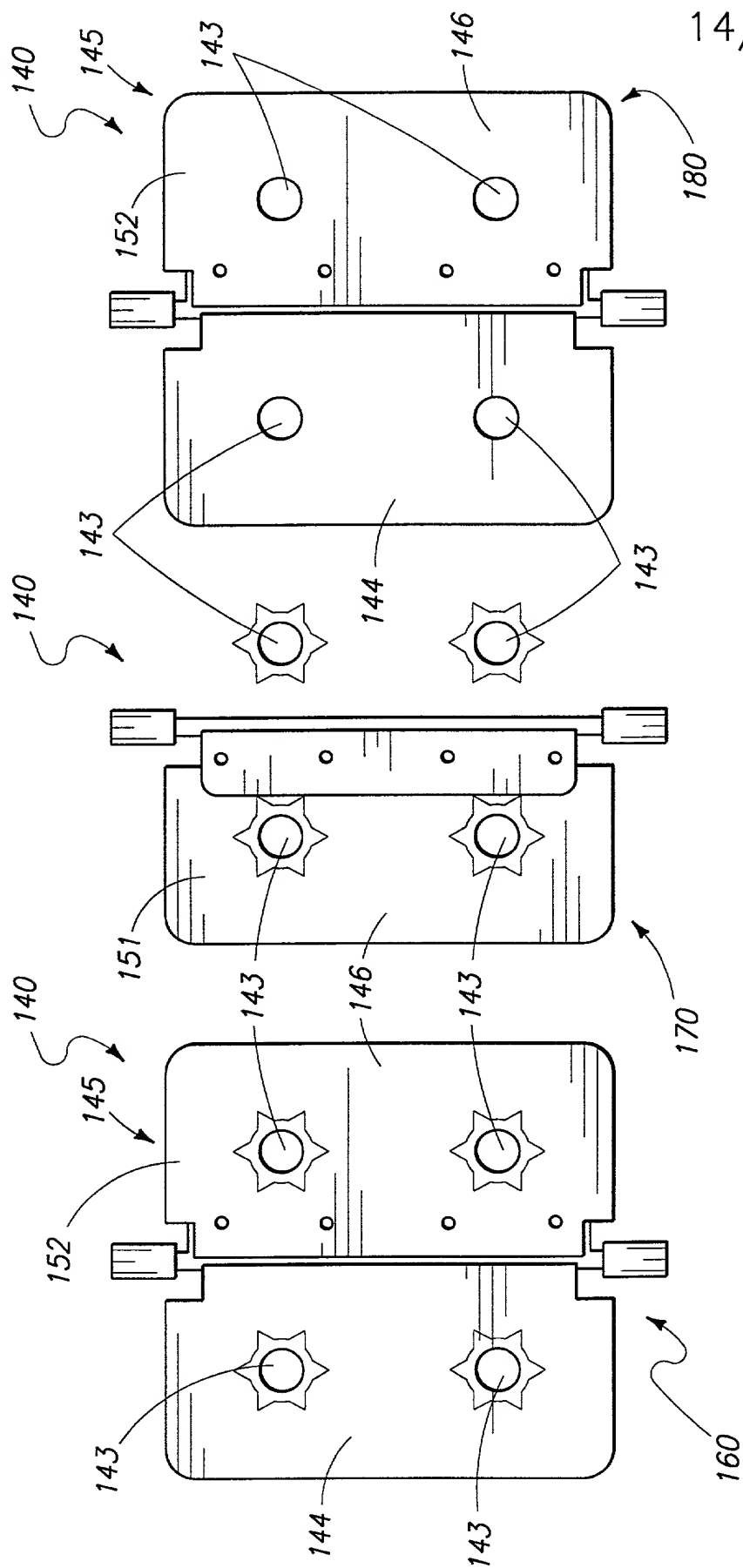


FIG. 12

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DECLARATION OF CONTINUATION-IN-PART FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled: "Pixel For Use in a Visual Matrix Display," the specification of which is attached hereto.

This application in part discloses and claims subject matter disclosed in an earlier filed pending application, "A Display Element With an Improved Reflective Lens, Serial No. 08/331,261, filed October 28, 1994; application Serial No. 08/331,261 is a continuation of application Serial No. 08/188,602, which was filed on January 27, 1994, now abandoned. Application Serial No. 08/188,602 is a continuation of application Serial No. 07/978,987, which was filed on November 19, 1992, also abandoned.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I hereby claim benefit under Title 35, United States Code, §120 in connection with said earlier filed application;

I acknowledge the duty to disclose information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56, including any such information which became available

EL 465851467

1 between the filing date of the prior application and the national or PCT
2 international filing date of this application.

3 As to the subject matter of this application, which is common to
4 said earlier application, I do not know and do not believe that the
5 same was ever known or used in the United States of America before
6 invention thereof or patented or described in any printed publication in
7 any country before our invention thereof, or more than one year prior
8 to said earlier application, or in public use or on sale in the United
9 States of America more than one year prior to said earlier application;

10 The common subject matter has not been patented or made the
11 subject of an inventor's certificate issued before the date of said earlier
12 application in any country foreign to the United States of America on
13 an application filed by me or my legal representatives or assigns more
14 than twelve months prior to said earlier application; and

15 As to applications for patents or inventor's certificate on the
16 common subject matter filed in any country foreign to the United States
17 of America, prior to said earlier application by me or my legal
18 representatives or assigns, I hereby claim foreign priority benefits under
19 Title 35, United States Code, §119 of any foreign application(s) for
20 patent or inventor's certificate listed below and have also identified
21 below any foreign application for patent or inventor's certificate having
22 a filing date before that of the application on which priority is claimed:

23 (None is claimed)
24

As to the subject matter of this application which is not common to said earlier application, I do not know and do not believe that the same was ever known or used in the United States of America before our invention thereof or patented or described in any printed publication in any country before our invention thereof, or more than one year prior to this application, or in public use or on sale in the United States of America more than one year prior to this application;

Said non-common subject matter has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application; and

As to applications for patents or inventor's certificate on the invention filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and certificate having a filing date before that of the application on which priority is claimed:

(None is claimed)

POWER OF ATTORNEY:

As a named Inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Richard J. St.

1 John, Reg. No. 19,363; David P. Roberts, Reg. No. 23,032; Randy A.
2 Gregory, Reg. No. 30,386; Mark S. Matkin, Reg. No. 32,268; James L.
3 Price, Reg. No. 27,376; Deepak Malhotra, Reg. No. 33,560; Mark W.
4 Hendricksen, Reg. No. 32,356; David G. Latwesen, Reg. No. 38,533;
5 George G. Grigel, Reg. No. 31,166; Keith D. Grzelak, Reg. No. 37,144;
6 and John S. Reid, Reg. No. 36,369.

7 Send correspondence to: WELLS, ST. JOHN, ROBERTS,
8 GREGORY & MATKIN P.S., 601 W. First Avenue, Suite 1300, Spokane,
9 WA 99204-0317. Direct telephone calls to: George G. Grigel (509)
10 624-4276.

11 I hereby declare that all statements made herein of my own
12 knowledge are true and that all statements made on information and
13 belief are believed to be true; and further that these statements were
14 made with the knowledge that willful false statements and the like so
15 made are punishable by fine or imprisonment, or both, under
16 Section 1001 of Title 18 of the United States Code and that such willful
17 false statement may jeopardize the validity of the application or any
18 patent issued therefrom.

* * * * *

Full name of inventor: Jerry L. Johnson

Inventor's Signature: Jerry L. Johnson

Date: DEC. 1ST, 1995

Residence: 14215 E. 8th Ave., Veradale, WA 99037

Citizenship: U.S.A.

Full name of inventor: Kevin M. Hanson

Inventor's Signature: Kevin M. Hanson

Date: 12-1-95

Residence: 2500 S. Church Road, Rathdrum, ID 83858

Citizenship: U.S.A.

Full name of inventor: Kenneth R. Cummings

Inventor's Signature: Kenneth R. Cummings

Date: 12-1-95

Residence: 8710 E. Mt. Spokane Park Dr., Mead, WA 99201

Citizenship: U.S.A.

Full name of inventor: Edward A. Wilson

Inventor's Signature: Ed Wilson

Date: 12-1-95

Residence: W. 3313 South Loop, Spokane, WA 99204

Citizenship: U.S.A.